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17. ABSTRACT (MAX. 250 WORDS)

Science concepts in the elementary school classrooms should be built from student experiences, not memorized from printed materials. Teachers should be alert at all times and consciously attempt to set up or call attention to situations providing opportunities for the use of problem-solving techniques. The following general areas are suggested as activities to stimulate problem-solving situations and develop scientific attitudes: class discussion, experiments, excursions or field trips, reading, use of audio-visual materials, allowing creative expression, observation, use of resource people, and evaluation.

Seven science areas have been allocated for special emphasis to the third grade level. The areas are: sound, plants, magnetism and electricity, heat, geology, chemical change, and animals. Units in each of these aspects of science have been prepared as teachers' guides. Suggested vocabulary words, apparatus, equipment supplies, ways to introduce the unit, problems and concepts, resource material, and classroom activities relating to each unit are included in the individual guides.

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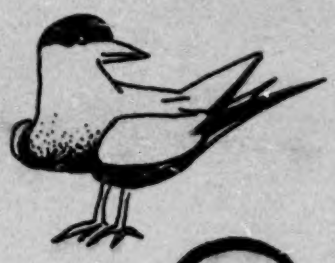
1964

Grade Three



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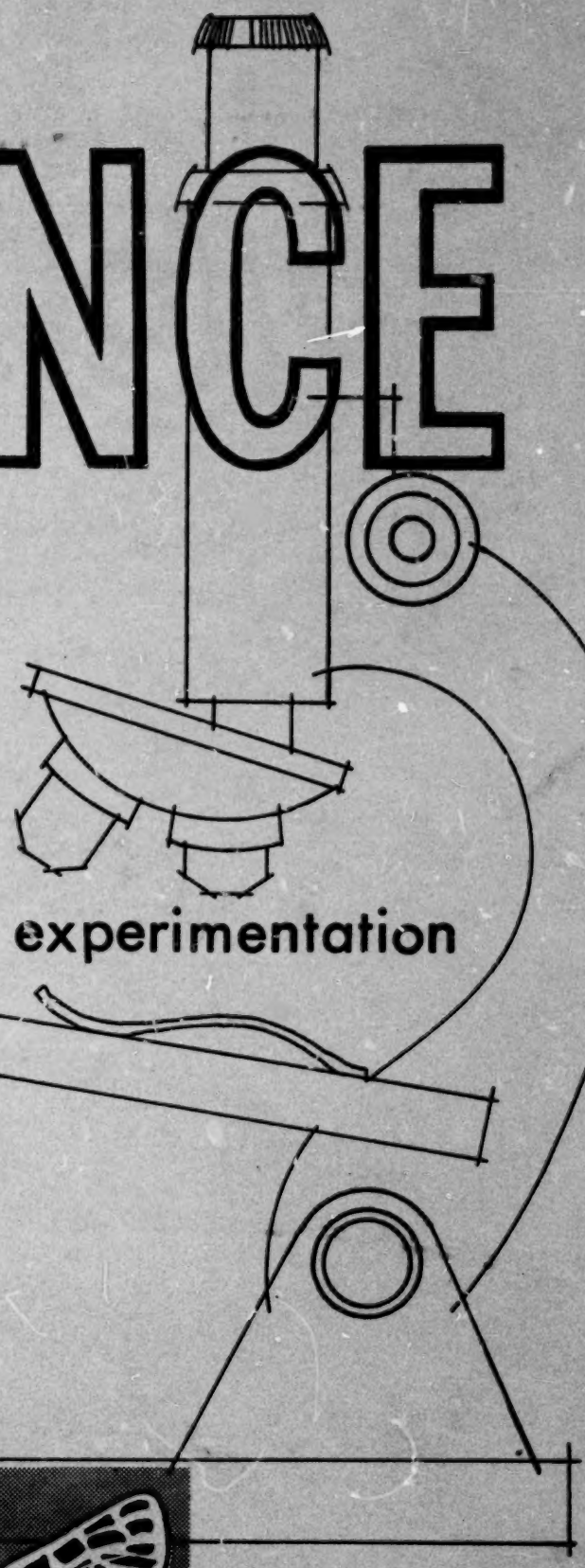
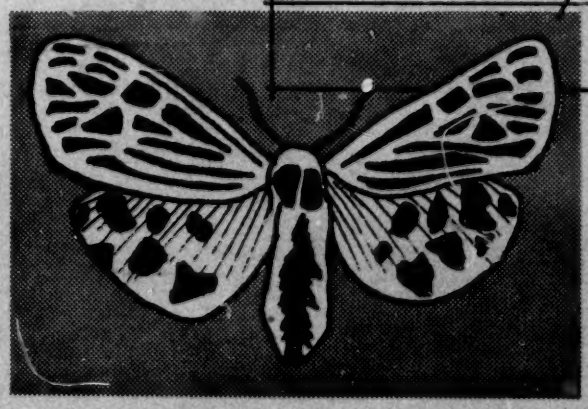
SCIENCE



experimentation

observation



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721 Capitol Avenue, Room 455
Sacramento 14, California

Fresno County Schools **Harold L. Coles, Sup't.**

FOREWORD

This Guide has been cooperatively prepared by personnel from school districts in Fresno County and by staff members in the Office of the County Superintendent of Schools. The primary purpose for its publication is to provide a source of help for teachers in implementing the Course of Study requirements for science.

The suggestions contained herein are not to be considered all-inclusive, or final. They are simply a record compiled by teachers who taught a unit but who may wish to alter it some way when they teach it again.

Teachers are urged to keep the unit up-to-date by consulting A.V. catalogs and the library for the latest instructional aids. You are urged to call upon staff members from this office who will be most happy to assist you in improving the science program in any way possible and will in turn appreciate constructive ideas which you may offer.

A limited number of copies of this unit have been produced so that revision can be made economically incorporating any modifications which may arise from use in the classroom.

This publication has been produced with knowledge and approval of the Fresno County Board of Education.

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Harold L. Coles

HAROLD L. COLES
Superintendent of Schools
Fresno County

HLC:nb

ACKNOWLEDGMENT

Recognition and sincere appreciation is expressed to those teachers who devoted many hours of effort both in and outside of the classroom to the preparation of this Guide.

Preparation of the Guide was greatly aided by the cooperation of Governing Boards and Administrators who provided two days of released time for the teachers who worked on the project.

Teachers, districts and administrators are as follows:

Teacher	District	Administrator
Jean Andreen	Selma	J. Frank Parks
Buena Ford	Sanger	Harrison R. Tyner
Dorothy McGranahan	Malaga	Samuel R. Smith
Betty Pedersen	Alta	Paul Clabaugh
Charlene Taylor	Monroe	James J. O'Brien

Members of the County Superintendent's Staff who also served are: Stewart Brown, Chairman of Science Curriculum Committee, Marian Barnes, Margaret Davis, Steve Niblack, and Ben H. Watkins.

* * * * * * *

SCIENCE COURSE OF STUDY

ALLOCATION OF SCIENCE AREAS FOR EMPHASIS

AREA OF STUDY	GRADES							
	1	2	3	4	5	6	7	8
Animals	X		X		X		X	
Astronomy		X		X		X		X
Chemistry			X	X		X		X
Conservation					X			X
Geology	X		X		X		X	
Heat		X	X			X	X	
Light		X				X	X	
Machines & Engines		X		X	X			X
Magnetism & Electricity		X	X		X	X		X
Meteorology		X		X		X	X	
Plants	X		X		X			X
Sound	X		X			X	X	
Water				X				

The division of responsibility for science instruction is shown on this chart. Such a division decreases the number of topics to be treated at any given grade level with a more thorough study made possible. If it is faithfully followed, it will also prevent gaps in science experiences.

If a particular topic was not studied during the year preceding, then the teacher must develop the concepts which otherwise would have been developed in the lower grade. Only in the seventh grade does a teacher ever have to go into a topic as created at a higher grade level.

In addition to the topics assigned to each grade, the teacher should feel free to give adequate treatment to any problems presented by children themselves as a "current" or "on the spot" science interest.

Generally speaking, the concepts to be developed in any area at any grade level will be found in the state adopted science texts for that grade or those used in a lower grade as mentioned in the second paragraph above. The fourth grade unit on water was developed from different science texts all of which are available as a Science Text Set for fourth grade. The seventh grade will need to use eighth grade references on topics which are studied for the last time in the seventh grade.* As a teacher in any grade, you may request a Science Text Set from the library which will aid in the development of concepts. You are also urged to use the unit materials from the library and the instructional aids from the Audio-Visual Department.

*See chart above.

The "HOW" of Teaching Science in the Elementary School

...concepts are built from experiences and not memorized from printed materials.

...the teacher must not tell pupils the answers
...the teacher's role is to establish the problem
...the teacher must let pupils make some mistakes

...teachers must be alert at all times and consciously attempt to set up or call attention to situations providing problem-solving techniques.

...experiments that do not work the first time often are the most productive learning situations.

...the following types of activities will promote and stimulate problem-solving situations and help develop scientific attitudes.

...discussion

---will help to answer problems
---will help clarify the problem or concept
---will help pupils realize that explanations are not always reliable--additional sources of information are needed
---will give pupils opportunities to share experiences about the problem or concept
---will encourage in thinking

...experiment

---will help clarify problems
---will help in finding solutions to problems
---will alleviate superstitions
---will need several performances to prove that experiment is reliable
---will be accompanied by reading and discussion
---should not be mere demonstrations on the part of the teacher or one pupil
---equipment should be left in the room for pupil use for several days
---children should be able to apply conclusions to other situations

*the application of the experiment and the method used in performing it are just as valuable as knowledge gained.

...excursion

---many opportunities are in the out-of-doors
---children should know "why" they are going
---there should be careful group planning
---extends child's interests, knowledge and understandings
---child grows in ability to observe and see
---child grows in learning to report accurately observations
---observations should be checked against authorities

...reading

---occupies a large place in science
---may develop leads for investigation
---orients pupil to the concept
---gives pupil illustrations to check for accuracy and information
---gives reliable information to check with observations
---science material may be the only kind of material some children will read

The "HOW" of Teaching Science in the Elementary School (Cont'd)

...audio-visual materials

---is another way to help solve a problem
---should not constitute the whole program
---there should be preparation for use and follow-up
---the teacher may need to use the material several times

*types of audio-visual materials that can be used

---realia--what one can see with the eye
---pictures
---collected specimens
---phonograph recordings
---live objects--plant or animal
---objects--rocks, minerals
---slides
---filmstrips and films

...construction

---individual and group projects do not constitute a science program
---one way a child learns is by doing
---children grow by manipulating and constructing when it has a purpose and extends an interest

...creative expression

---the idea expressed and the science concepts should be important, not the product itself

...observing

---first hand experiences are the most valuable
---helps to determine how things look
---helps to determine how things act
---helps us to be aware of cause and effect
---helps us to realize change and interdependence in plants and animals
---helps us to interpret things that we read
---helps us to realize how man controls his environment (soil, water, etc.)

...collecting

---satisfies a natural curiosity of children
---be sure the collection is helping to solve a problem
---plan collections carefully so they have meaning
---collections do not constitute the science program

...resource people

---can give reliable information about the local area
---help to stimulate interest

*resource person should be able to talk on the level of the group

The "HOW" of Teaching Science in the Elementary School (Cont'd)

...<u>evaluation</u>

---activities designed for evaluating are extremely useful as learning activities
---achievement should always be interpreted in relation to the device used
---teachers should also place a value on the experiences she has offered the children

ARRANGING THE CLASSROOM FOR SCIENCE INTERESTS

I. <u>The Nature Table</u>:

A. What type of table should be used for the display?

1. Any regular classroom table.

2. Any space designated as "display space" in the room planning. (ledge, top of low cupboard, etc.)

3. A round table. (ideal because of accessibility)

B. Where should the display table be placed?

1. The display table should be in any central, easily-accessible place.

C. When should the display table be used?

1. Use the table upon arrival of the children before school formally opens.

2. Use the table during work time.

3. Use the table after clean-up time -- if time permits.

D. How long should science materials be displayed?

1. Some displays should be permanent.

a. Fish.

b. Turtles.

c. Insect homes.

2. Other displays should be changed to match the seasons and as often as the children's interests dictate.

II. <u>Ways of Displaying Science Materials</u>:

A. Arrange the display on colored paper.

B. Arrange on small trays of various sizes.

C. Arrange on paper plates. (various sized plates may be painted by the children.)

D. Use cardboard boxes with cellophane inserted as a window in the box lid.

E. Use test tubes, or alka-seltzer bottles, etc., in a test tube rack to display wild or garden flowers, weeds, etc.

F. Use corrugated paper rolled tightly as holders to display feathers, weeds, etc.

Arranging the Classroom for Science Interests (Cont'd)

G. Use rocks in a bowl of water to grow bulbs.

H. Use glass bowl for observing seed germination, planting seeds close to the glass.

I. Display science books and pictures on stands with objects on display.

J. Use an aquarium for displaying fish and marine life.

K. Use a terrarium for displaying plants and small animals.

L. Use small plastic bags to display seeds and leaves.

M. Cages for visiting pets may be placed near the science center. (call about restrictions from County Health Department)

N. An insect house may be placed in the science display center.

THE THIRD GRADE CLASSROOM - A SCIENCE LABORATORY

A third grade science program is an experiencing, creative program; filled with discovery.

Whenever children are allowed to wonder, they discover wonders!

The teacher is an important part of the classroom environment. She provides the climate. May it always be brisk and sunny!

Interesting bulletin boards stimulate thinking and invite experimentation.

SCIENCE NEWS

HOW IS A PIECE OF TOAST LIKE A POSTAGE STAMP?

Original drawings and creative writings reflect the current activities.

A true scientist experiments, records, and experiments again.

Fascinating books lead explorers into amazing and mysterious discoveries.

A science table or science corner welcomes contributions continually, and invites further exploration and experimentation.

Labels supply pertinent information.

Collections are made and labeled for general information.
Some ready-made collections supply good research material.

Many pictures and study prints are available to extend information and concepts.

Science equipment is readily available for eager scientists.

SCIENCE MEANS WONDERING

SCIENCE MEANS EXPLORING

SCIENCE MEANS EXPERIMENTING

SCIENCE MEANS DISCOVERING

SCIENCE MEANS LEARNING

SCIENCE GUIDE

Unit Sound

Grade Three

Fresno County Schools
HAROLD L. COLES, Superintendent
September, 1964

INTRODUCING THE UNIT

Children are quite aware of sounds in this space age with its sonic booms.

A demonstration with rubber bands or string stretched across a box so that children can strum, is of interest. Or, if you have an autoharp available it is a good way for children to get a clear picture of sound associated with strumming and they delight in trying to play it.

VOCABULARY

directed

distant

pitch

pluck

outer

reflected

sound

sound waves

tuning fork

vibrates

vibrating

APPARATUS, EQUIPMENT, AND SUPPLIES

cereal (few grains)

dishpan

drums (2)
  1 bass
  1 snare

flower pots (2)
  1 large
  1 small

glass baking dish

metal hammer

metal screwdriver

pebbles

rubber bands

tin cans (2 smooth edge)

tuning fork

wooden desk or table

PROBLEMS AND CONCEPTS	RESOURCES
I. What is sound?	Books:
Sound is made when something moves and vibrates.	Scott Foresman, Science is Exploring, pp. 66-67
II. How can sound be produced?	Scott Foresman, Science is Exploring, pp. 64-65
Sound can be produced in many ways: people, animals, birds, vehicles, appliances.	*Podendorf, The True Book of Sounds We Hear
When people speak their vocal cords vibrate.	Tuning Fork Stringed Instrument
III. How do sounds move from place to place?	Motion Picture:
A vibrating object makes the air around it vibrate and sets up sound waves.	"Sound and How It Travels"
Sound travels in all directions.	Books:
	Scott Foresman, Science is Exploring, pp. 68-69
IV. Does sound take time to travel?	Scott Foresman, Science is Exploring, pp. 71-72
The sounds of fireworks, jet aircraft, and distant things take a while to get to us. They travel through the air.	Books:
Sound can be directed	Scott Foresman, Science is Exploring, p. 70
Sound can be reflected.	*Baer, Sound, p. 42
Sound travels through many materials. This also takes time.	*Pine and Levine, Sounds All Around Us
	Baer, Sound, pp. 55-63
	Scott Foresman, Science is Exploring, pp. 74-75
	*Baer, Sound, pp. 27-28

*Suitable for children's reference.

ACTIVITIES

Problem I.

a. Strike a tuning fork with a hard object and then hold a pencil next to the fork. What shows you that the fork is moving? Strike a tuning fork again and plunge it into a pan of water. What happens? Why?
b. Put cereal on a drum and strike the drum. Ask:

   1. What do you hear?
   2. Do you see any part of the drum move when you hit it?
   3. How does this help you see what part of the drum is moving?

c. Stretch rubber bands across a box. Then pluck the string. Ask:

   1. Can you hear anything?
   2. Can you hear anything when the string stops moving?

d. Pluck the strings of a stringed instrument. What makes it hum?

Problem II.

a. Have class put hands on their throats. Hum a note. Feel the vibrations.
b. Class discussion: "Ways that sound is produced."
c. Ditto exercise: "How do you make sounds with each of these?" (See page 7 of this unit.)

Problem III.

a. Watch motion picture: "Sound and How It Travels."
b. Drop a pebble in a pan of water and watch the ripples move.
c. Hit the tuning fork again and help children draw comparison to rippling water.
d. Ask children to listen to sounds and decide where they come from: Up, down, sideways?

Problem IV.

a. Ask children to name sounds that come from a distance.
b. Demonstrate with stop watch. Have a child go off a long distance and on a hand signal call out. See how long it takes for the sound to reach us.
c. Steer sound around a corner. See Baer, Sound, p. 57.
d. Sound doubles back. Call into a container and then hold the container to your ear.
e. Experiments: Ear to the ground; solids favor sound. (See Baer, Sound, pp. 27-29)
f. Make a set of tin can telephones and have children use them.
g. Hit two stones together under water. What do you hear?
h. Have one child put ear to wooden table. Have another strike tuning fork at other end.

PROBLEMS AND CONCEPTS

V. What makes sounds different?

We hear many different kinds of sounds around us.

Some sounds are loud; some are soft.

Some sounds are high; some are low.

When an object vibrates rapidly it makes a high sound.

When an object vibrates slowly, it makes a low sound.

VI. How do we hear sound?

Our outer ears help us to hear sounds.

RESOURCES

Books:

Scott Foresman, Science is Exploring, pp. 72-75

*Baer, Sound, pp. 45-53 and pp. 65-72

*Baer, Sound, pp. 73-97

*Pine and Levine, Sounds All Around Us

Filmstrip:

"Sounds Around Us"

Books:

*Adler, Your Ears

Scott Foresman, Science is Exploring, pp. 78-79

Motion Picture:

"You and Your Ears"

Recording:

"Sounds Around Us"

*Suitable for children's reference.

ACTIVITIES

Problem V.

a. Have children strike a bass drum and a snare drum.
b. Demonstration: One long box with string stretched from end to end and one short box with string from end to end. Strum the strings and notice which strings vibrate fastest. Determine the difference in pitch due to vibration.
c. Demonstration: Have children strike one large flower pot and then strike a small flower pot. Listen to the difference in pitch.
d. Demonstrate with piano by removing the front panel and allowing children to watch the movement of the hammers and the resultant vibration of strings.

Problem VI.

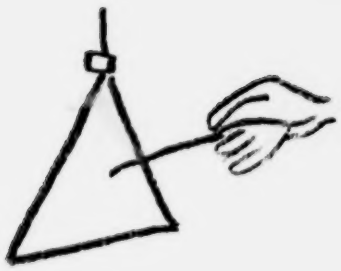
a. Arouse interest by having children demonstrate by cupping ear and turning away from sound; listening with one ear covered; comparing ear to a funnel. (See page 8 of this unit.)

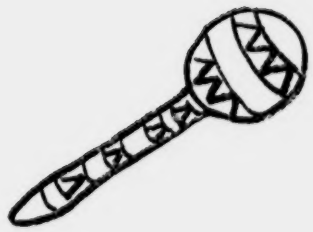
b. Watch motion picture "You and Your Ears." Discussion.

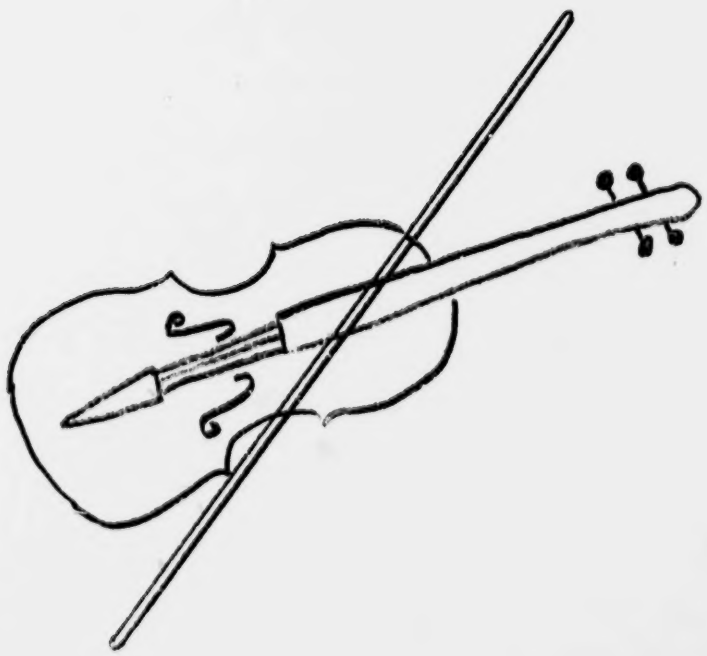
c. Culminating activity: Listen to the recording "Sounds Around Us." Identify sounds.

HOW DO YOU MAKE SOUNDS WITH EACH OF THESE?

Problem II. b.
(See "Activities" p. 4)

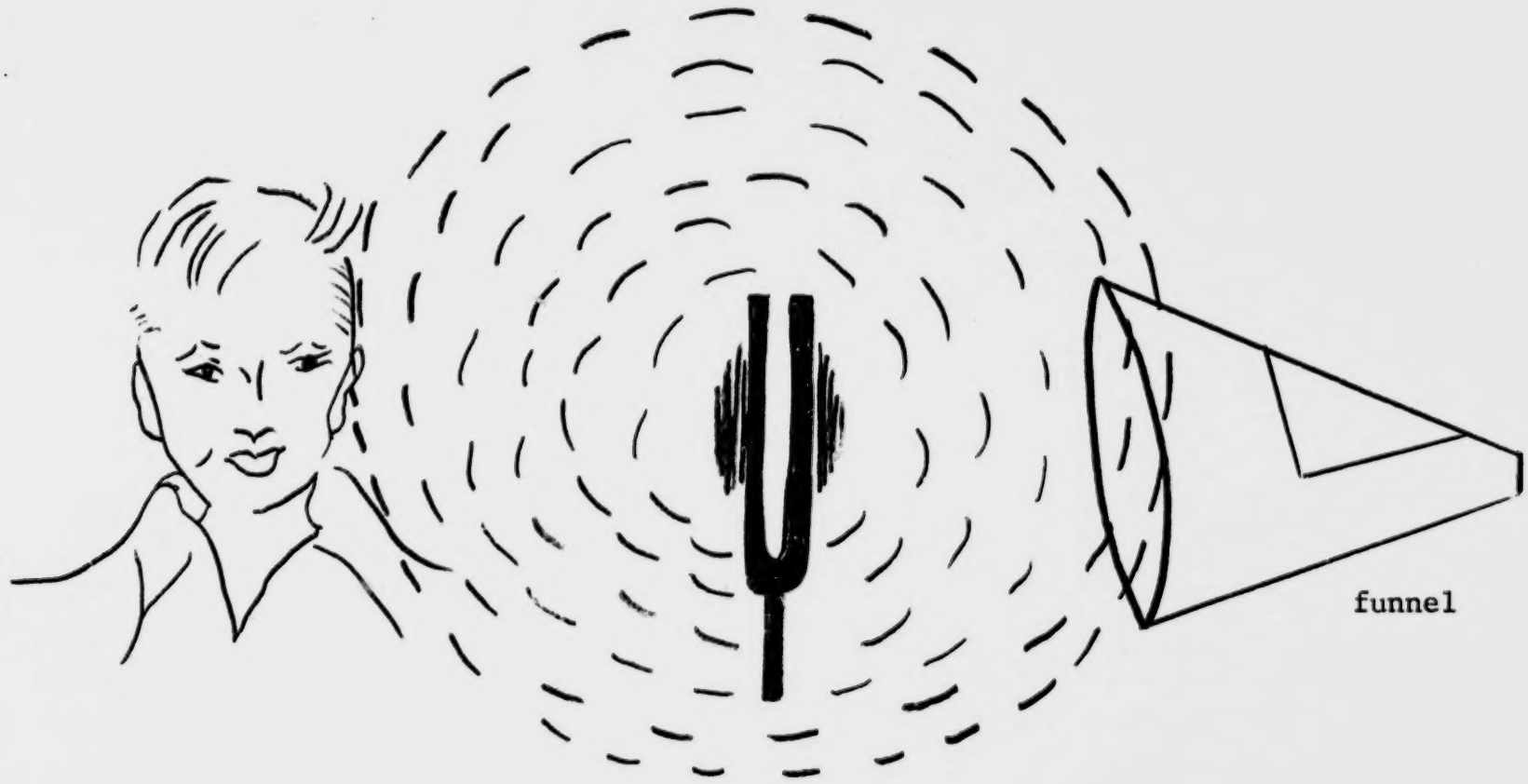


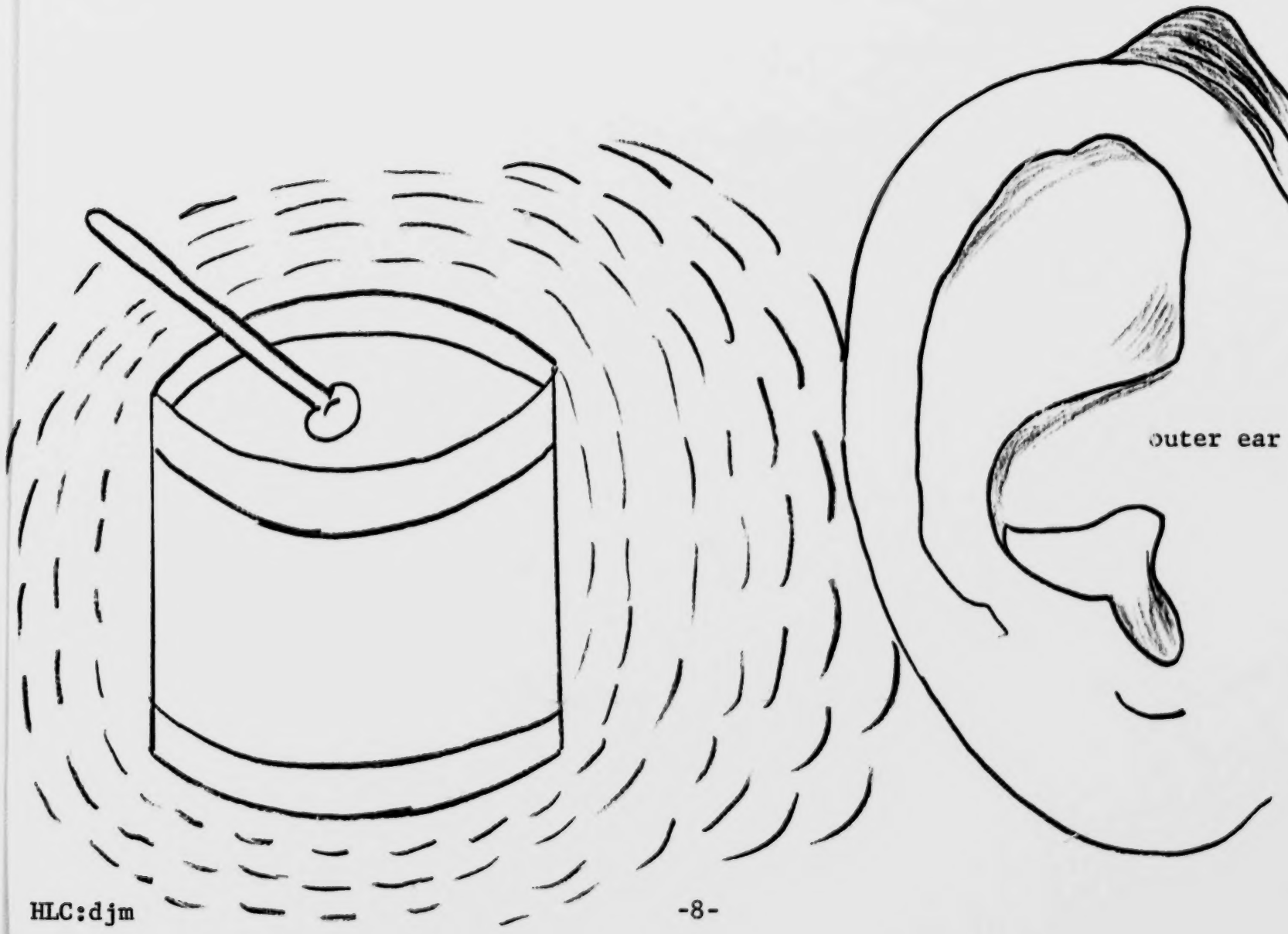




HOW OUR OUTER EAR HELPS US HEAR

Problem VI. a.
(See "Activities" p. 6)





SCIENCE GUIDE

Unit Plants

Grade Three

Fresno County Schools
HAROLD L. COLES, Superintendent
September, 1964

VOCABULARY

autumn
baby
bark
blossom
branch
bud
bulbs
change
cones
cork
cotton
flowers
fruits
garden
germinate
glass
grow
hitchhike
ivy
leaves
limb
linen
lumber
mammals
nuts
observe
paper
petals
plant
pollen
roots
rubber
scattered
seasons
seeds
shade
shelter
spring
soil
stems
stones
summer
sunlight
temperature
thirsty
trunk
vegetables
water
wind
winter

APPARATUS, EQUIPMENT, AND SUPPLIES

blotters or paper towels
box
bulbs
carbon paper
carrots
celery
chart paper
cotton
dishes for germinating seeds
glass squares
glass jars
glue for mosaics
iron for pressing leaves
ivy stem
knife
leaves (begonia)
magnifying glass
onions
potatoes
pots for planting seeds
rocks (gravel)
seeds (corn, squash, bean)
soil
tempera paint
wax paper

INTRODUCING THE UNIT

This unit was introduced by setting up the classroom environment in the following way:

1. One bulletin board showing an enlarged seed drawing illustrating the inside of the seed. The caption - - "WHAT IS A SEED?"

2. Another bulletin board showing flowers growing in soil, sun shining, and a child watering the flowers. The caption - - "WHAT DO PLANTS NEED TO GROW?"

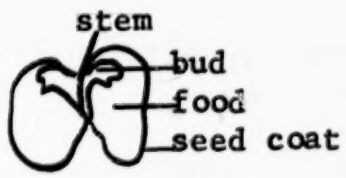
3. On the science table were placed books opened to pictures and stories of plants. There were samples of various seeds set out under the caption "DO YOU KNOW WHAT PLANTS WILL GROW FROM THESE SEEDS?

This environment led to a discussion of what we already knew about plants and to a listing of concepts or questions stating what we wanted to learn. From here, our unit could move directly into the first concept activities and reading pertaining to this.

PROBLEMS AND CONCEPTS	RESOURCES
I. How Do Plants Grow?	**Books:**
A. Some plants grow from seeds.	Unitext, Plants Round the Year, pp. 19-27
1. Inside seed is baby plant. 2. Roots grow down and stems up. 3. The seed provides food to start the plant.	Heath, Science in Your Life Beauchamp, Science is Learning, pp. 102-106
B. Some plants grow from bulbs.	Krauss, The Carrot Seed
1. Food stored in bulb feeds baby plant. 2. Part of bulb grows into stem. 3. Part of bulb grows into root.	Miner, The True Book of Plants, pp. 22-36 Bond, Thinking About Science, pp. 142-154
C. Some plants grow from roots.	**Periodicals:**
D. Some plants grow from stems.	The Instructor
E. Some plants grow from leaves.	"The Science That Blooms in the Spring," p. 26, April, 1957 "The Strawberry," p. 92, May, 1962 "Tulip Time," p. 71, Sept., 1962 "The Seed That Grew," p. 60, March, 1961 "The Crocus," p. 90, April, 1958 "The Onion," p. 83, April, 1962
	Films:
	"From Seeds to Plants" "Wonders of Plant Growth"
	Filmstrips:
	"Finding Out How Plants Grow" (3007f) "How Seeds Sprout and Grow Into Plants" (5006f) "Plants and Seeds" (2621)

ACTIVITIES

A. 1. Soak large seeds in water for a day. Open and discover parts of seeds. Use magnifying glass to examine if necessary.



2. Plan bulletin board or scrapbook showing pictures of various plants that grow from seeds and those that grow from bulbs.

3. Germinate seeds between wet paper towels. After four days open one seed. Continue opening a seed every four days and observe plant growth. Keep chart record of growth progress observed.

4. Place corn, squash, pumpkin seeds at different angles between glass plates and a blotter. Tie the plates together and place in pan of water. As the seeds grow, this experiment will prove that stems grow up and roots down. Later some seeds can be left between glass and others placed in soil. This will prove that plants need soil for growth.

B. 1. To observe how plants grow from bulbs, place an onion on top of a jar of water. The roots should be resting in the water. Observe the way the onion grows.

2. Cut an onion open to see parts of a bulb. Make enlarged drawing and label parts of a bulb.

3. Planting white Narcissus bulbs can also be a good project for observing the growth of bulbs. (Directions are on p. 168 of Science is Learning Manual.)

C. To observe how plants grow from roots, carrots, beets, turnips and sweet potatoes can be placed on top of a jar of water with their roots resting in water.

D. To observe how plants grow from stems, snip off a piece of ivy stem having two "Y" shaped joints one above the other. Plant in moist sand, deep enough to cover the lower joint. Keep out of direct sunlight in order to encourage root growth, not leaf growth.

E. To observe how plants grow from leaves, cut across each of the large veins of a large rex begonia or African Violet leaf. Then lay it right side up on damp sand in a dish. Weigh it down with pebbles along the edge.

PROBLEMS AND CONCEPTS	RESOURCES

II. What Do Plants Need To Grow?

A. A plant needs water. The water is soil water.

B. A plant needs soil. The minerals in the soil are in the soil water.

C. A plant needs sunlight. A plant kept in the dark does not make food.

D. A plant needs air and proper temperature. Air enters the plant principally through the leaves.

E. Most plants make their own food. Plants put the air, water, and minerals together and make food.

Light helps the plant make food.

The food is made in the leaves and other green parts of plants.

Food is stored in other parts of the plant.

We eat the part of the plant where the food is stored:

- roots (carrot)
- leaf stalk (celery)
- fruit (tomato, peach)
- seed (food for new plant)

Plants protect their food:

- Roses have thorns.
- Poison ivy has poison.
- Many plants are hard and tough.
- Some have a strong odor.

Books:

Unitext, How the Sun Helps Us, pp. 18-23

Science is Learning, pp. 107-115

Science Here and Now, Grade 3 pp. 58-59, 173-207

True Book of Plants We Know, pp. 35-36

Podendorf, Plant Experiments

Films:

"Frank Tends the Garden"

"Let's Watch Plants Grow"

"What Plants Need for Growth"

Filmstrips:

"How Plants Live" (5004f)

"Plant Needs" (5010f)

"Plants" (2608)

"Plants Grow"(5501)

"Plants Grow and Change"(3325)

ACTIVITIES

A. 1. To prove plants need water, place seeds between paper towel or blotter and jars. Water only two. As plants grow, water only one and observe the effect this has on plant growth.

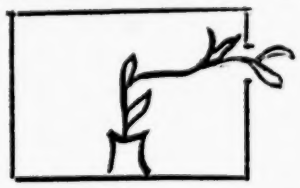
2. Experiment on how water and other foods are brought up into the plant. Get two fresh stalks of celery, put one into a glass of red ink and leave it for awhile. Look at the other stalk. You will see long lines on it. Pull away some of these lines. Show that these are thin tubes. The red ink will go up the tubes.

B. To prove need for soil, place one seed in soil and one among rocks. Water both and observe rate of growth.

C. To prove plants need sunlight:

1. Place one plant in sunshine and another in a dark place.

2. Place plant in a long box with a hole cut toward the top of the box. Plant will seek the light.



3. Place black paper over one leaf of a plant and cellophane over the other.

D. 1. To prove plants need air, place one plant under jar and leave the other plant in the fresh air.

2. To prove that plants need proper temperature for growth, wet three cotton pads and sprinkle some seeds on each pad. Place in saucer and cover. Put one in a cold place (refrigerator). Put one in a hot place (by furnace). Put one in area with even temperature. Notice growth progress.

E. 1. Make a chart showing where plants store food.

Plant	Where it Stores Food
_____	_____
_____	_____

2. Make a list of plants that have special protection features. Make a collection of plants to show how plants protect their food.

PROBLEMS AND CONCEPTS	RESOURCES

III. What Steps Does A Plant Follow As It Grows?

A. Seeds germinate under proper conditions.

B. Roots grow down and stems up.

C. Leaves and flowers grow on stems.

D. Flowers make fruits and seeds.

E. Seeds are scattered in various ways.

F. Seasons influence plant growth.

Books:

Weber, Bits That Grow Big

Peter, California Wonder World, pp. 88-91

Parker, Leaves

Unitext, Plants Round the Year

Science Far and Near, pp. 87-95, 133-136

Science is Learning, pp. 116-123

Science in Your Life, pp. 129-132

Unitext, Seeds and Seed Travelers

Jordon, Seeds By Wind and Water

The Wonderful World of Science, California State Series, Grade 4, pp. 153-165

Zim, What's Inside of Plants?

World Book, "Seeds"

Films:

"Spring on the Farm"

"Summer on the Farm"

"Learning About Seeds"

"Weeds and Mosaics"

Filmstrips:

"The Parts of a Plant"

"How Seeds are Scattered" (5005f)

Periodicals:

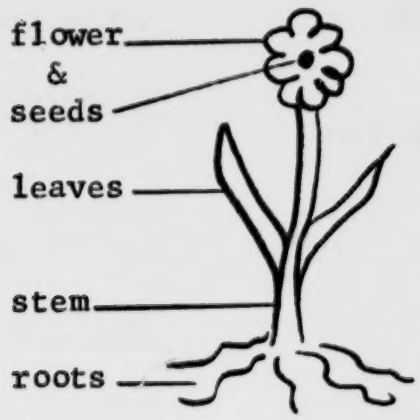
The Instructor

"Autumn Activities," p. 90, October, 1962

"Autumn Leaves" p. 110, September, 1952

ACTIVITIES

C. 1. Make charts of bulletin board displays showing plant parts.



2. Collect leaves and press them between two pieces of wax paper with a warm iron.

3. Press leaves into plaster of paris or ceramic clay in shallow containers. Mark name into clay after removing leaf.

4. Transfer leaf designs onto plain paper or fabric by rubbing ribbed side of leaf with the broad side of a crayon. Place leaf, crayon side down, on material. Cover with another sheet of paper or fabric. Press with a warm iron. Repeat process to make various designs.

5. Carbon leaf prints:

Materials: pressing iron, carbon paper, paper towels, typewriter paper.

a. Place a fresh piece of carbon paper on the table with the carbon side of the paper uppermost.
b. Place the leaf of your choice on center of carbon. Place vein side of leaf down.
c. Cover completely with paper towel.
d. Iron on medium heat (never allow hot iron to come in contact with carbon paper). Press towel firmly and completely a few seconds.
e. Remove leaf from carbon and place carbon side down onto white paper. Cover with paper towel.
f. Press as before. Print will not smudge.

D. Set up exhibit of different kinds of fruits. Classify them as nuts, grains, vegetables and other fruits.

E. 1. Make collection of seeds for making seed mosaics and collages.

2. Make chart or bulletin board display showing how seeds travel. Classify them under the following headings: Wind-Borne Seeds, Seeds That Hitchhike, Seeds That Pop From Plants, Seeds That Travel By Water.

F. Have a committee plan and draw a mural showing the changes in plant life as the seasons change.

PROBLEMS AND CONCEPTS	RESOURCES

IV. How Do Plants Help Us?

A. They are a source of food for mammals.

B. Parts of plants are used for food.

leaf - lettuce, chard, etc.
stem - asparagus, sugar, etc.
roots - potatoes, carrots, etc.
flowers - cloves, etc.
fruit - apples, oranges, etc.
seed - peas, corn, nuts, etc.

C. Plants give us clothing.

cotton
linen
rayon) synthetics
viscose)

D. Paints are made from cottonseed and linseed oil.

E. Some medicines are made from plants.

castor oil
antibiotics
vitamins

Books:

World Book, "Plant"

Science Far and Near, pp. 87-95, 133-136

Unitext, Useful Plants and Animals, pp. 24-36

The True Book of Plants, pp. 37-44

Wonderworld of Science, Book 3, Old State Text

Films:

"How Plants Help Us"

Filmstrips:

"Plants We Use" (5014f)

"The Parts of a Plant" (5009f)

"The Story of Cotton" (8109)

"The Story of Bread" (8105)

"The Story of Fruits and Vegetables" (8108)

Study Prints:

"Vegetable Market"

Slides:

"Wildflowers," Set 1

"Wildflowers," Set 2

"Wildflowers of the San Joaquin Valley"

Art Reproductions:

Struck, "Plowing," Ar245

Van Gogh, "Vegetable Garden" Ar23

Rivera, "The Flower Vendor" Ar9

ACTIVITIES

B. 1. Bring samples of foods and clothing obtained from different parts of plants. Classify under:

Leaves Stems Roots Flowers Seeds

2. Make potato, celery, and carrot prints. Cut potato in half. Cut out a design in the potato. Dip in tempera and print design on construction paper. The design can be enriched with celery and carrot prints also.

3. Make a box movie showing the things we can obtain from plants.

4. Make a scrapbook of pictures children have drawn or found in magazines and classify under:

Foods We Get From Leaves
Foods We Get From Roots
Foods We Get From Stems
Foods We Get From Flowers
Foods We Get From Seeds

Written reports should be included with the pictures.

C. 1. Make a bulletin board of products of plants. Examples:

"Mary, Mary"(tending her garden)
Green plants
Flowering with dresses, and hats
Medicine
Furniture

2. Dramatize "Useful Plants," in Wonderworld of Science, Book 3.

3. Explore the interesting story of a peanut plant. Discover how it grows and the many products of the plant (like a pea plant whose peas grow back into the ground). Read the story of George Washington Carver.

PROBLEMS AND CONCEPTS	RESOURCES

V. What Are Trees and How Do They Help Us?

A. Trees are large plants.

1. They grow from seeds.
2. They make a ring all around each year.
3. Every part of the tree has something to do.

B. Different kinds of trees make different kinds of wood. Some woods are hard, some are soft.

C. Some trees are very large. Some trees live for a long time.

Fresno County has some of the largest trees in the world.

D. Man has many uses for trees. Nearly every tree is good for something.

shade
lumber
paper
cork
rubber
maple sugar
turpentine
chocolate
nuts
fruits

Books:

Cormack, The First Book of Trees

Lemmon, Trees

Darby, What is a Tree?

Pistorius, What is a Tree?

Schneider, Science Far and Near

Forest Plants, State Text

Periodicals:

The Instructor

"Are There Giants?" October, 1957, p. 60

"How to Know Trees" April, 1963, p. 65

"Trees" March, 1956, p. 35

Films:

"Trees: How We Identify Them"

Filmstrips:

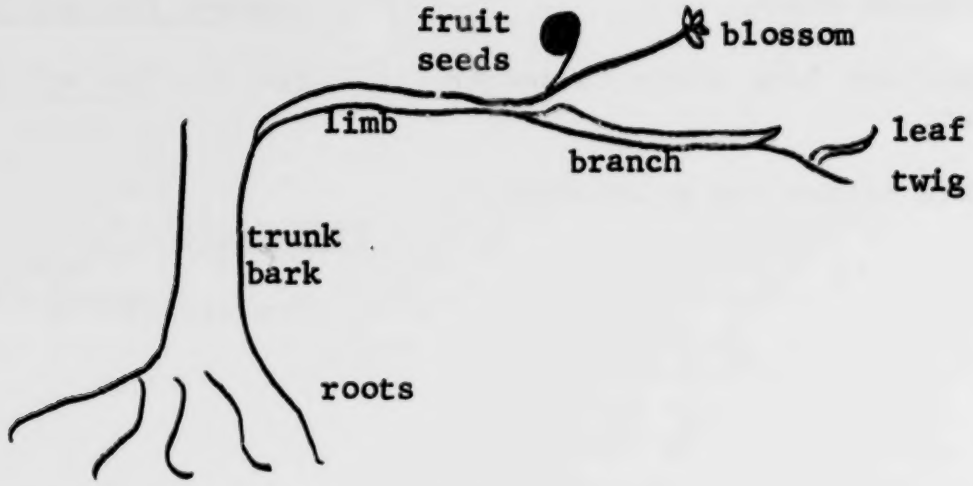
"The Story of Rubber" (8111)

"Trees" (5508)

"Trees Grow" (5506)

ACTIVITIES

A. 1. Make charts of a tree labeling the parts.



2. Take walks and observe the different types of trees and how they change with the changing of the seasons. Learn the names of trees around school.

3. In spring observe the blooming fruit trees. Have the children draw the trunks and branches of the trees with crayon on paper. Each child can be given a small piece of sponge. This can be very lightly dipped in light red or yellow tempera paint and applied to the drawing as blossoms.

4. Observe a tree stump and try to count the growth rings.

5. Visit a park or grove of trees to gather samples of bark, leaves, and seeds.

B. 1. Visit a lumber yard. Ask about different kinds of wood. Observe the way lumber is cut and stacked. Look for ring markings on lumber. Make a list of the different kinds of lumber and what the different kinds are used for.

2. Lift different pieces of wood of the same size. Notice the difference in weight.

3. If there is a lumber mill in your vicinity plan a trip to watch logs being unloaded and sawed into lumber. Notice rings on logs. Discuss kinds of trees.

C. 1. Let children who have visited giant sequoias tell about them. Look at pictures. Discuss age, size, branching, and other interesting features. Locate groves on a map. Find out about "The Nation's Christmas Tree." Where is it? What kind of tree is it? Look for pictures.

PROBLEMS AND CONCEPTS	RESOURCES
VI. Desert Plants have Special Desert Ways	**Books:**
A. Cactus store water.	Science Far and Near, pp. 23-36
B. They send out long roots in search of water.	Pettit, The Web of Nature, pp. 38-41
C. They have spines for protection.	**Filmstrips:**
	Deserts (5213)

ACTIVITIES

A. 1. Make a table top scene. Place sand on table. Children can bring samples of various cactus to be planted in the sand. Clay models of desert animals can be made and also an Indian pueblo made of shoe boxes. A mural background of a desert scene adds to this display.

2. Make drawings of various types of cactus.

3. Experiment to prove the shape of the cactus helps it to store water:

Cut two narrow strips of paper. Wet both of them. Crumple one of the pieces into a round ball. Leave the other piece straight and flat. Put both pieces in a warm place, and wait for them to dry. Crumpled one will dry more slowly, proving a fat shape (like that of a cactus) stores up water.

This booklet was compiled as the unit progressed

Page 1

WHAT IS A SEED?

_____

_____

Draw a picture of a seed. Name its parts.

Page 2

WHAT DO PLANTS GROW FROM?

1. _____
2. _____
3. _____
4. _____
5. _____

Draw pictures of plants that grow from:

Seeds	Bulbs	Stems	Leaves	Roots

Page 3

Draw pictures showing the things plants need to grow.

Sun

Soil

Water

Page 4

Draw a plant and a tree. Label the parts (flower, leaves, stem, roots, trunk, bark, limb, branch, twig, fruit, seed).

Plant	Tree

SCIENCE GUIDE

Unit Magnetism & Electricity

Grade Three

Fresno County Schools

HAROLD L. COLES, Superintendent

September, 1964

VOCABULARY

MAGNETISM

attracts

compass

dry cell

electromagnet

lodestone

magnetic

needle

North Pole

permanent

repel

South Pole

temporary

ELECTRICITY

appliances

cable

circuit

conductors

current

dry cell

electricity

flashlight

fuse box

insulators

lens

nonconductors

overload

power

reflector

socket

switch

telegraph

APPARATUS, EQUIPMENT AND SUPPLIES

bar magnets

block of wood

compass

copper wire (insulated)

cylindrical magnets

doorbell

dry cell batteries (1 or 2) (6 volt)

dry cell battery (6 volt)

flashlight

flat corks

glass dish

globe

horseshoe magnet

insulated wire

iron filings

large nail

light bulb (6 volt)

magnetized darning needles

nails (2)

socket

steel items

switch

"U" shaped magnet

waxed paper strips - 4" x ½"

INTRODUCING THE UNIT

Magnetism

To stimulate interest in this unit, a challenging bulletin board, children's reference books and study prints on display are invaluable. Group participation in the construction of magnetic boats is interesting. Use waxed paper strips, 4" x ½", a flat cork, paper sail, and magnetized darning needle for a boat. The boat will float in water. Creates great interest as it is directed one direction and another with a magnet.

Electricity

There is really no problem to stimulate children's interest in electricity. A collection of pictures about how we use electricity and a discussion of how electricity helps us in the classroom makes a good beginning.

A demonstration on how electricity creates heat is usually a good experiment with lots of interest and seems to stimulate a good many questions.

One other introduction that is exciting to the children is a simple demonstration with a balloon rubbed on your arm to make the children's hair stand up, or make the balloon stay on the wall.

PROBLEMS AND CONCEPTS	RESOURCES
I. What is a natural magnet?	Books:
A natural magnet is a kind of rock called magnetite that attracts certain metals.	*Parker, B. Magnets Unitext booklet, State, 4th grade
	*Fervolo, Junior Science Book of Magnets
A natural magnet is called a lodestone.	Study Print:
	Magnets
II. How do magnets work?	Books:
Magnets attract objects made of iron and steel.	*Podendorf, True Book of Magnetism, p. 6
	*Yates, Boy's Book of Magnetism, pp. 32 and 39
Magnets attract even through glass, paper, plastic.	
III. What is the difference between permanent and temporary magnets?	Books:
Bar and horseshoe magnets are permanent. They retain their force.	Scott Foresman, Science Is Exploring, p. 89
An electromagnet is temporary. Its force fades without the electric current.	*Yates, The Boy's Book of Magnetism
	*Suitable also for Children's References

ACTIVITIES

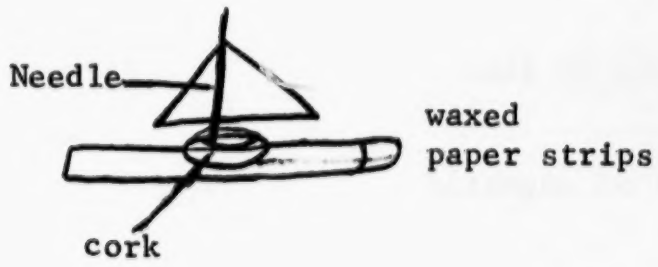
Problem I.

a. Bulletin board: Do You Know How Magnets Work? See Appendix.

b. Read the legend of the magnet from Unitext booklet, Magnets.

c. Study prints as review and to stimulate new interest.

d. Construct magnetic boats: Use two strips of waxed paper 4" x ½", a flat cork and a magnetized darning needle, paper sail. Observe movement of boat in water. Use a magnet to make the boat sail in the direction wanted.



Problem II.

a. Try magnets on many different items to distinguish between those attracted by magnets. "Make a List" ditto. See Appendix.

b. Play "Magnetic Pickup Sticks." Place nails in a row and try to pick one up at a time without touching or moving any of the others.

c. Play "The Race of the Magnetic Washers." Place washers in a grooved board. Players must coax "racers" with magnets.

d. Demonstrate with toy metal car on top of glass and magnet underneath. Show that a magnet will hold through plastic and paper.

e. Ditto exercise: Crossword Puzzle. See Appendix.

f. Refer to Problem I. Discuss how the darning needle was magnetized. Discover by experimenting what other things can be magnetized.

Problem III.

a. Demonstrate retained force of bar and horseshoe magnet in contrast to fading force of magnetized pin or needle.

b. Construct an electromagnet with a nail, insulated wire and dry cell battery.

c. Make a display with pictures and magnets to show how magnets vary in size, shape, and kind.

PROBLEMS AND CONCEPTS	RESOURCES
IV. What is the law of magnets? Unlike poles <u>attract</u>, like poles <u>repel</u>. A magnet has a north pole and a south pole. A magnet is strongest at its poles.	Books: Scott Foresman, <u>Science Is Experimenting</u>, pp. 86-87 Bar magnets "U" magnets Film: "Magnets"
V. How do magnets help us find direction? The earth is full of magnetic materials. The earth has two poles - North and South - which attract the poles of a magnet. A compass needle is a freely swinging magnet that tells direction. The compass needle is pulled by the magnetic force of the earth.	Filmstrip: "Magnets Help Us Find Direction" Globe Books: Scott Foresman, <u>Science Is Experimenting</u>, p. 93 *Podendorf, <u>True Book of Magnetism and Electricity</u>, p. 11 Large compass
VI. How do we use magnets in everyday life?	Books: *Pine & Levine, <u>Magnets and How We Use Them</u>, pp. 30, 31
VII. How do we use electricity? Electricity gives us heat and light and provides power for machines. Electricity is in use all around us.	Picture of appliances. Books: Scott Foresman, <u>Science Is Exploring</u>, pp. 46-47 *Heath, <u>Elementary Science</u>, pp. 264-268

*Children's References

ACTIVITIES

Problem IV.

a. Attach bar magnet to string and suspend it. Hold a second bar magnet to it and try bringing like poles together and then opposite poles together. Let the children participate.

b. Use iron filings on cardboard or clear plastic and hold magnet underneath to demonstrate direction of force. CAUTION: (1) Be sure to keep filings and magnet separated or you are lost! (2) Keep filings in a good container.

c. Show film, "Magnets."

d. Let children pull at cylindrical magnets to demonstrate force of poles.

Problem V.

a. Show filmstrip, "Magnets Help Us Find Direction."

b. Study the globe and its poles.

c. Make a compass. See Appendix.

d. Check the action of the handmade compass against the action of the large compass and help children observe the free movement of the magnetic needles. Be sure children are thoroughly familiar with North, South, East and West concept.

e. "Pretend You Are Lost" game. Blindfold child and turn him once or twice to confuse his sense of direction. Have him (or her) use the compass to reestablish northern direction.

Problem VI.

Read from Magnets and How We Use Them, pp. 30, 31 and ask for other ways that children can think up.

See Magic and A Magnet Hunt in Magnets, Parker.

Problem VII.

a. 3rd Dimensional Bulletin Board: See Appendix.

b. Have children collect pictures that show uses of electricity. Discussion.

c. Discuss ways that electricity helps us in the classroom; electric lighting, phonograph, film projector, radio, slide projector, loud speaker.

PROBLEMS AND CONCEPTS	RESOURCES
	Filmstrips: "How Electricity Helps Us" "Wonder of the Telegraph" "Wonder of the Electric Light"
VIII. What safety rules do we need to know in using electricity? Never touch a switch with wet hands or while standing in water. Never overload connections. Electricity can be dangerous if not properly handled. Never put electric wires under carpets or rugs. Never put a penny in the fuse box. Never place anything except a plug into a socket. Never poke around the radio or television set if the switch is on.	Ditto material.
IX. How does electric current flow? Electricity comes to our homes on wires from a central power plant. Electric current flows in a circuit. Electric current will only flow when there is a complete circuit.	Motion Picture: "The Flow of Electricity" Books: Heath, Science Far and Near, pp. 272, 273 *Freeman, The Story of Electricity, p. 34 *Edison, Experiments You Can Do *Yates, A Boy and a Battery *Children's References

d. Watch filmstrip, "How Electricity Helps Us."

e. Demonstration: Dry cell, two wires, and paper. See Science Far and Near, p. 267.

Problem VIII

a. Ditto exercise: See Appendix. Discussion.

Problem IX.

a. Watch film, "The Flow of Electricity."

b. Demonstrate with flashlight or light bulb and dry cell how a broken connection cuts off the light.

c. Study ditto on flashlight to see path of current. See Appendix.

d. Start file of pupil cards, Questions and Answers. See Appendix.

PROBLEMS AND CONCEPTS	RESOURCES
X. How do we use a dry cell? A dry cell produces electricity which can ring a bell or light a globe.	Books: Scott Foresman, Science Is Exploring, p. 59
XI. What will an electric current flow through? Electricity will not flow through rubber, plastic, or cloth covering on wires. These things are called nonconductors. Electricity will flow through copper wire, a nail, a silver coin. These things are called conductors.	Books: Scott Foresman, Science Is Exploring, pp. 50-51 *Feravolo, R. Junior Science Book of Electricity, pp. 23-28 *Edison, Experiments You Can Do *Meyer, Picture Book of Electricity
XII. How can we control the flow of electricity safely? A switch is a convenient, safe way to control electricity.	Books: *Feravolo, R. Junior Science Book of Electricity, pp. 32-36 Heath, Science Far and Near, p. 276

*Children's References

ACTIVITIES

Problem X.

a. Demonstrate with dry cell, insulated wire and doorbell and ask children how this same principle was demonstrated in the earlier experiment with the light bulb.

Problem XI.

a. Connect dry cell to nail in board and to a light. Complete the circuit with another wire from the light to a second nail in the board. Place various items on the two nails and observe which ones cause the light to go on and which do not.

Problem XII.

a. Read about the use of switches to control electricity in the State text, Science Far and Near, p. 276.

b. Use a switch with the dry cell and light or bell to demonstrate control. Allow children to manipulate switches around the room. See Appendix.

c. Culminating activity: Draw a mural to show flow of electricity through town and country.

d. Culminating activity: Draw a picture about "things you have learned about magnetism and electricity."

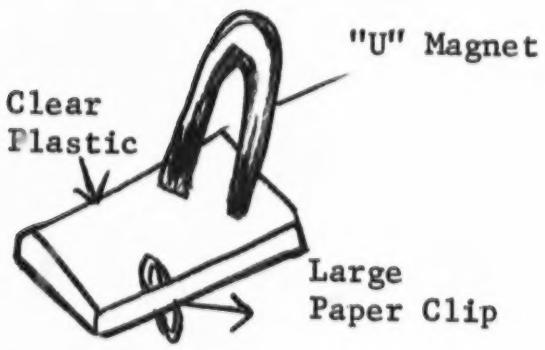
APPENDIX

Problem I.

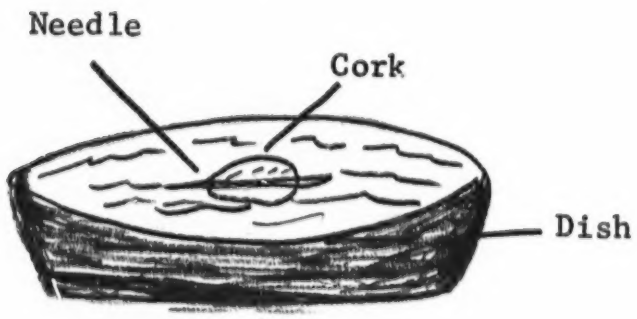
Suggested bulletin board in three dimension.

Do you know -

How magnets work?



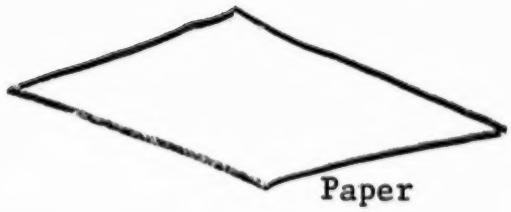
How a compass is like a magnet?



MAGNETS

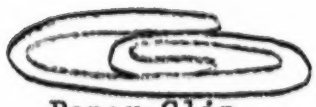
Problem II. (a)

Pins

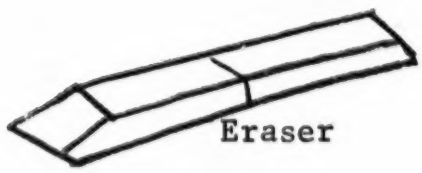


Paper

Sticks

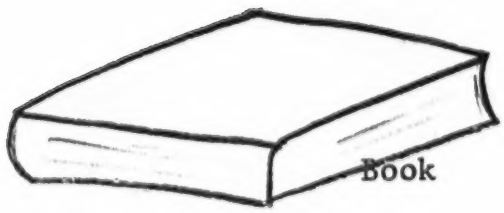


Paper Clip



Eraser

Bobby Pin



Book

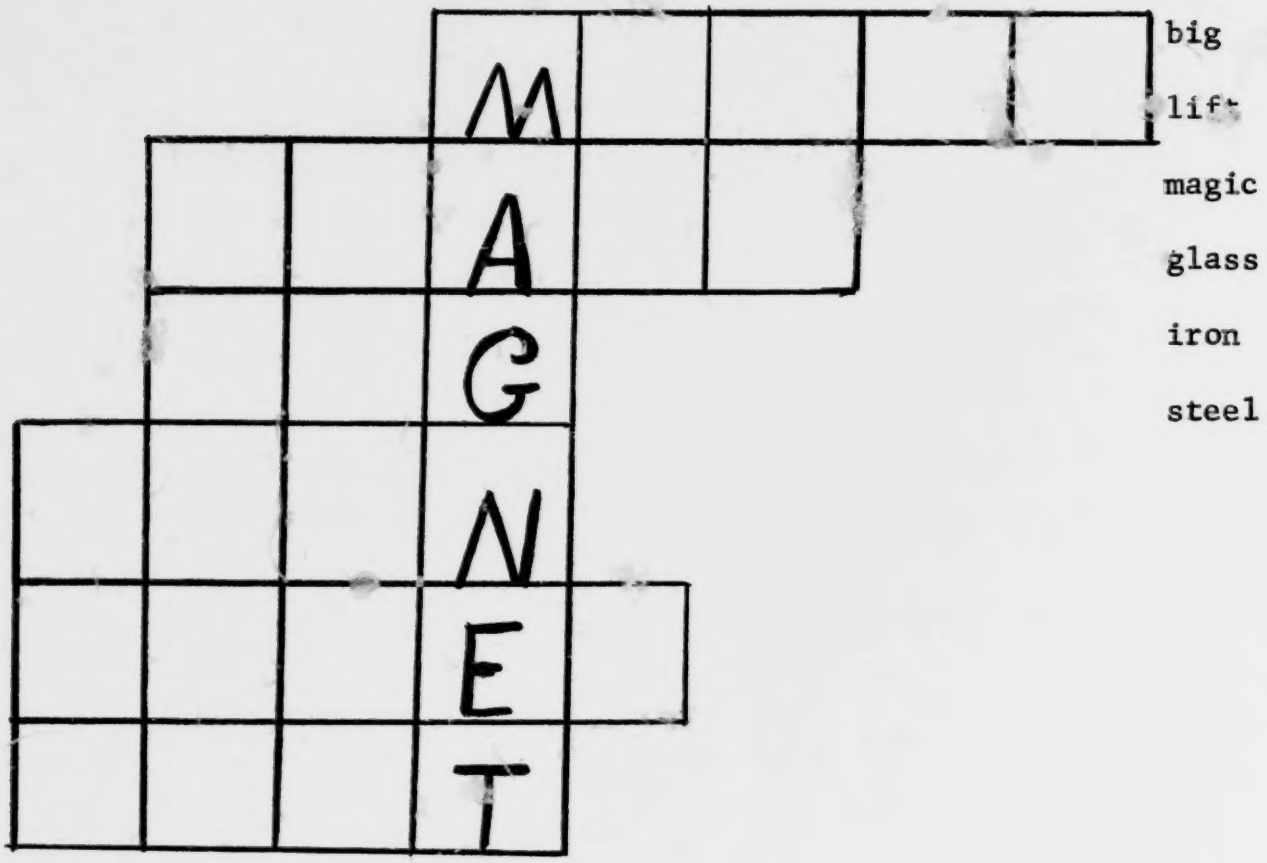
Tacks

MAGNETS PICK UP

MAGNETS DO NOT PICK UP

Problem II. (d, e)

Can you find where the words belong?



big

lift

magic

glass

iron

steel

MAKE A COMPASS

Problem V. (c)

You need a glass dish, water, a magnet, a steel needle and a flat cork. Stroke the needle one way on the magnet to magnetize it; cut a thin groove across the cork and lay the needle in the groove. Fill the dish with water and float the cork in the center so that it is free to turn without bumping the sides of the dish.

SUGGESTED THREE DIMENSIONAL BULLETIN BOARD

Problem VII.

Great electrical inventions -

a phonograph

a radio

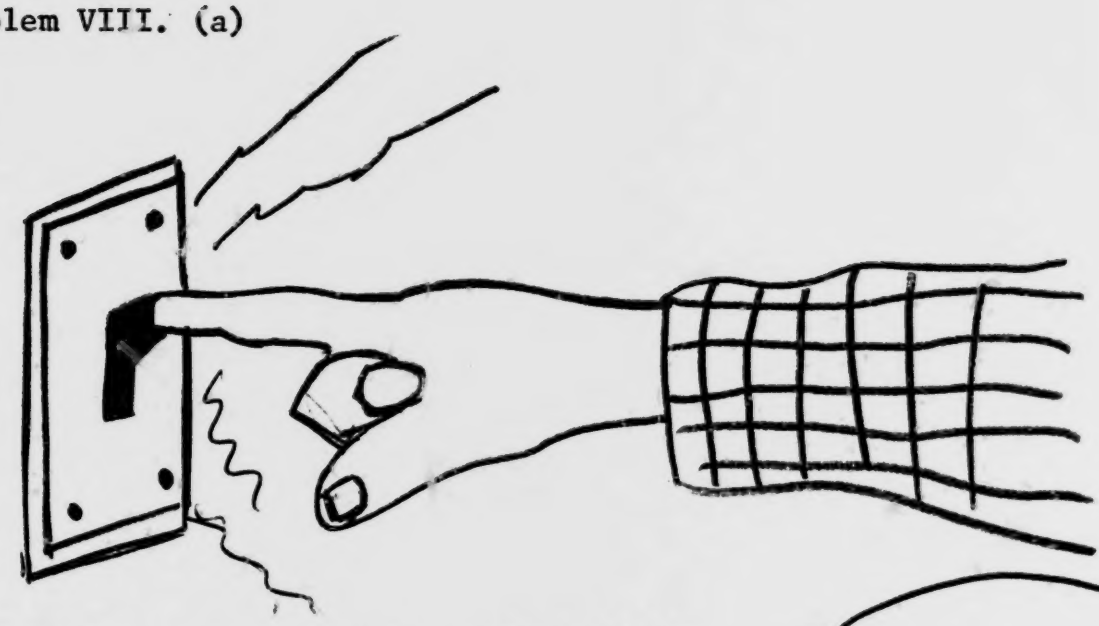
motion picture projector

electric light bulb

Commercial patterns for these items are available.

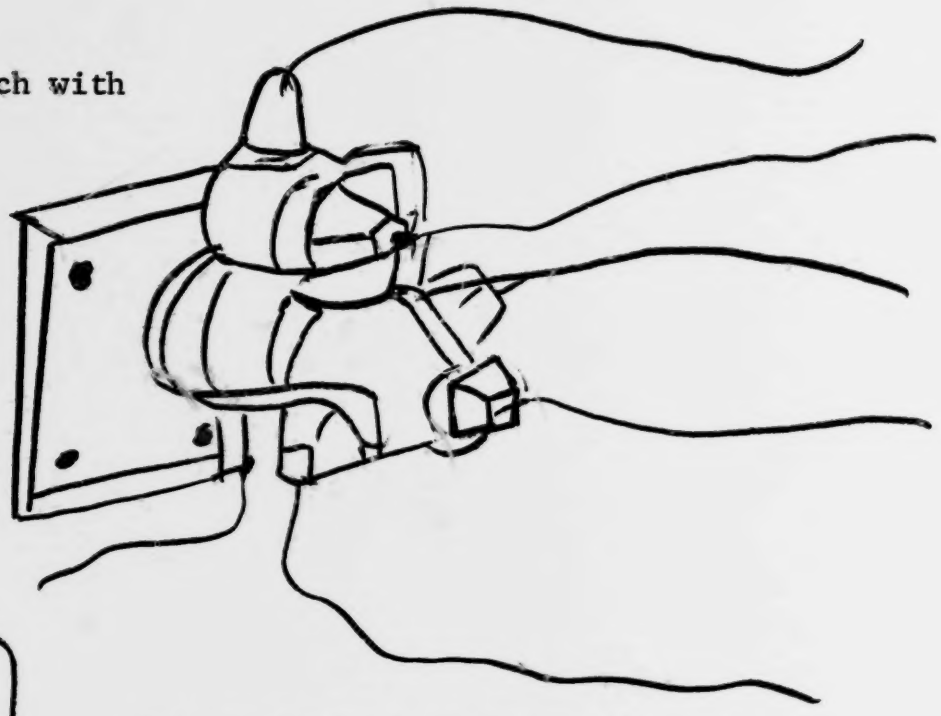
WHY MUST WE OBSERVE SAFETY RULES?

Problem VIII. (a)



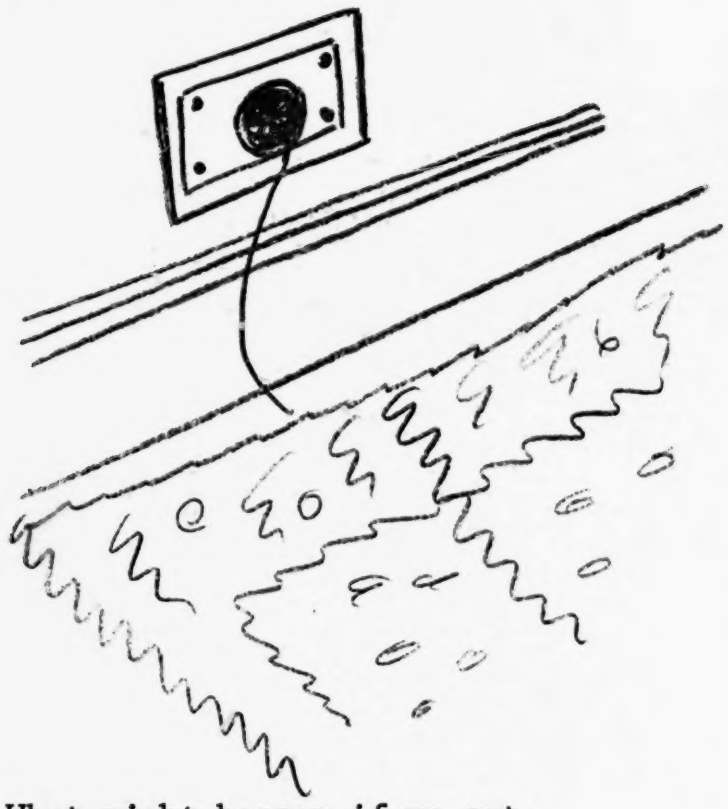
Why should we never touch a switch with wet or damp hands?

Why should you never pull a chain if you are standing on a wet floor?

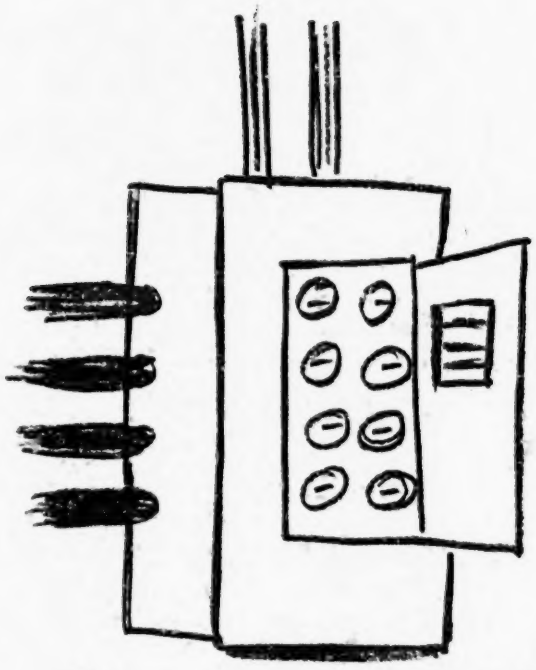


Do you have an octupus connection in your house?

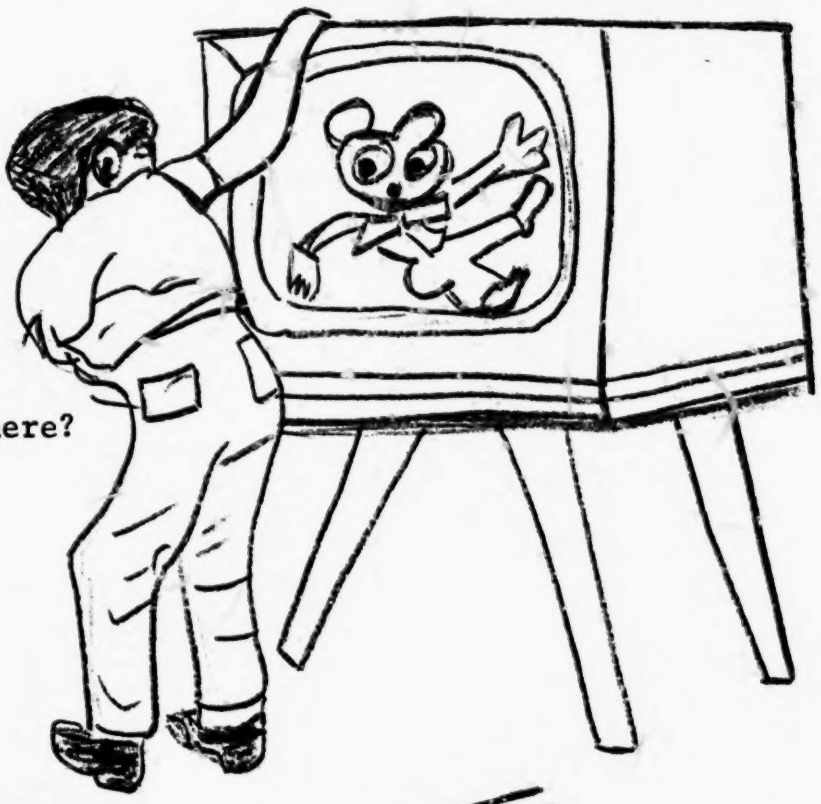
Problem VIII. (a)



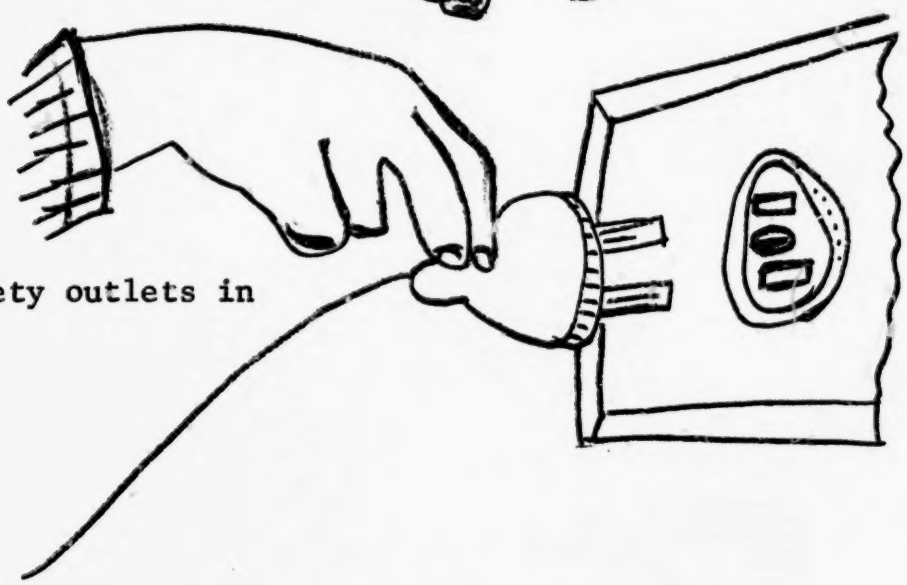
What might happen if we put electric wires under carpets or rugs?



Did you know a penny could cause a fire?



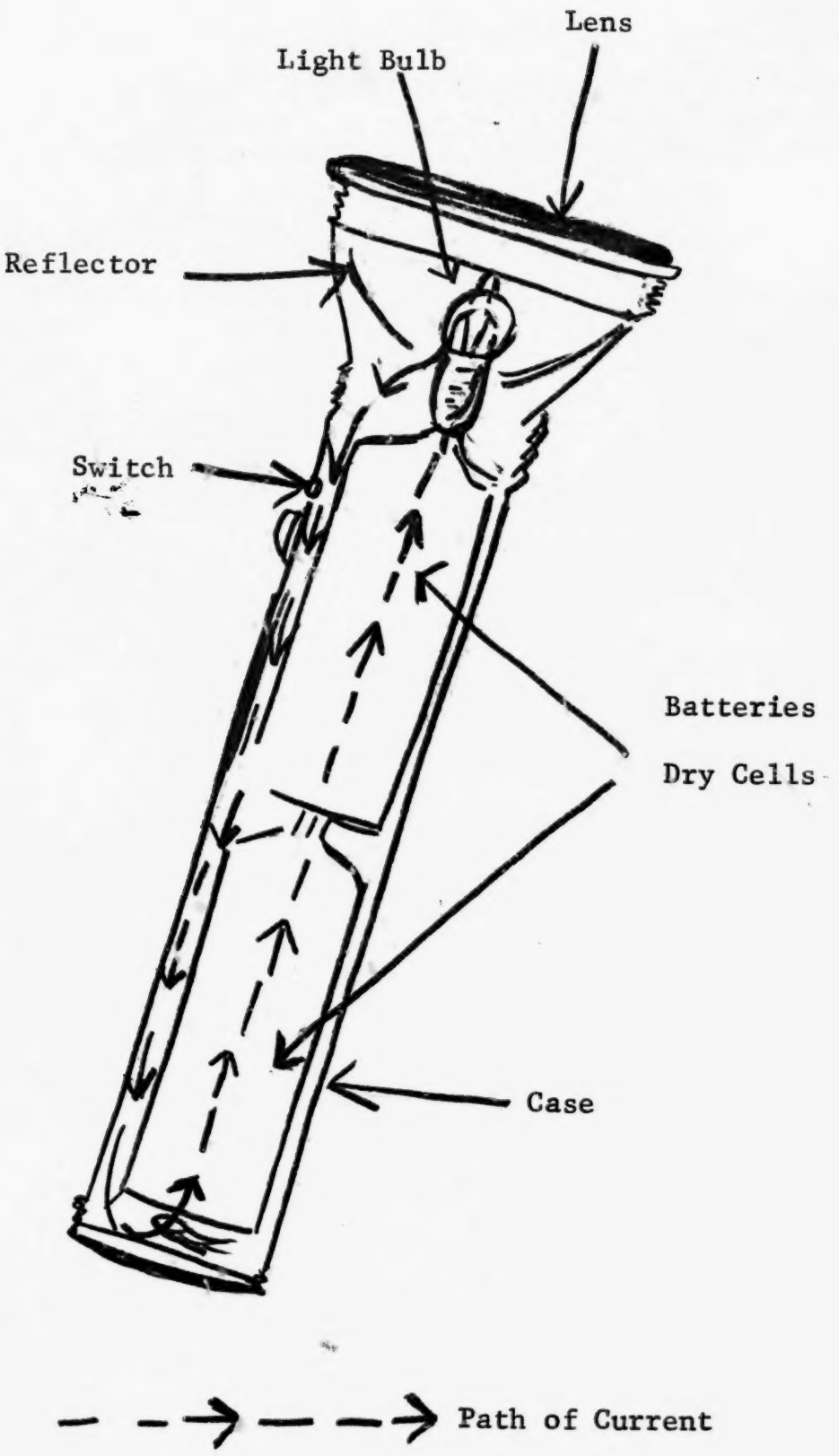
What might happen here?



Do you have safety outlets in your house?

THE FLASHLIGHT

Problem IX. (c)



FILE CARDS FOR CHILDREN'S RESEARCH

Problem IX. (d)

Example:

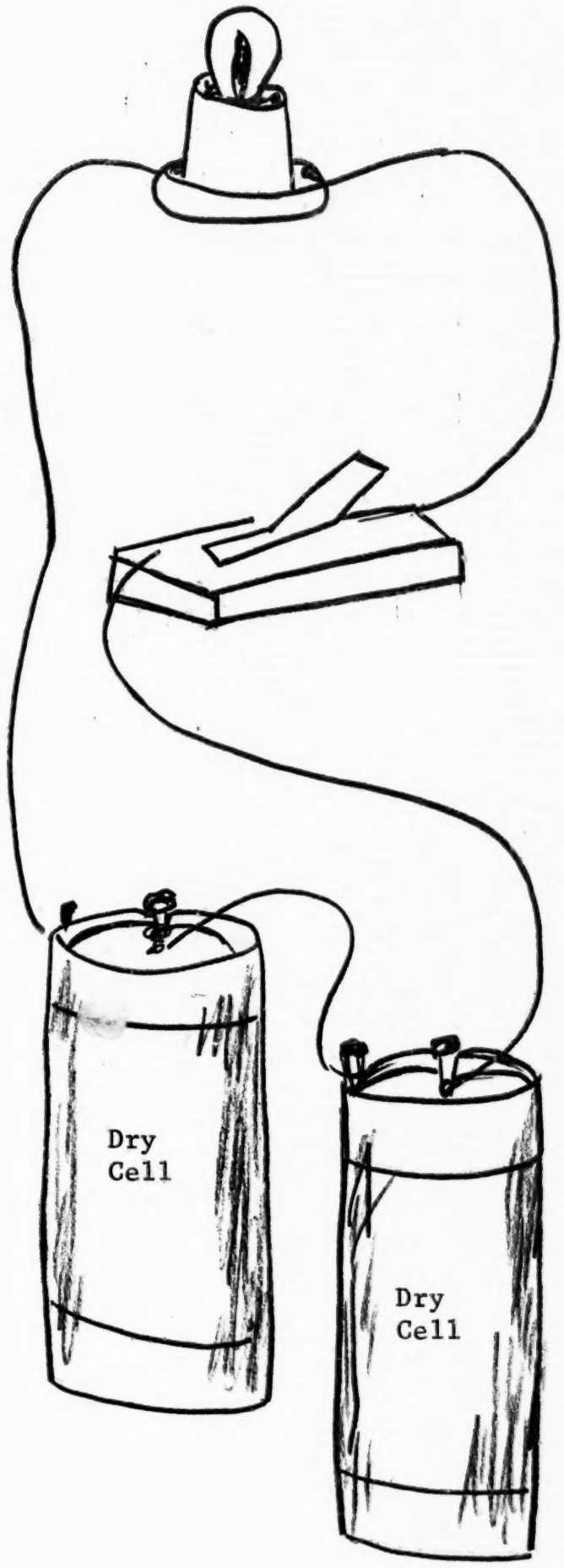
Pupil Card #1	Electricity
Reference: Freeman, <u>The Story of Electricity</u>, p. 34	
Question: How does electric current flow?	
Answer: _____	
_____	
_____	
_____	

Set up an entire file of these cards for enrichment activities.

Use these cards, if desired, as a <u>Problem of the Week</u> experience.

Problem X. (a)

We open or close an electrical circuit by using a switch. It is safe and easy to use.



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SCIENCE GUIDE

Unit **Heat**

Grade **Three**

Fresno County Schools
HAROLD L. COLES, Superintendent
September, 1964

INTRODUCING THE UNIT

This unit assumes that the Fresno County Schools Course of Study has been followed, and that the third grade pupils have already been introduced to the study of heat. The concepts of the second grade are concerned with sources of heat, uses of heat, and measurement of heat.

A good introduction in third grade will be a review. Construct a bulletin board which shows various sources of heat: Sun, burning, electricity, and friction. Such pictures as drying clothes, electric dryers, heaters, and warm clothes will help children review heat concepts and stimulate thinking.

Make a list of the things we use in our daily living that involve the concepts of heat to be studied in grade three. Emphasize the importance of heat in our everyday life.

VOCABULARY

I. burning

candle	fireplace	gas
coal	friction	heaters
electricity	furnace	sun
	warmth	

II. friction

generation of heat	kindling temperature
ignite	resistance
	spontaneous combustion

III. absorption of heat

burning or combustion	contraction	expansion
oxidation		

APPARATUS, EQUIPMENT, AND SUPPLIES

I. pictures of various sources of heat

II. bicycle pump

boxes of matches (kitchen, safety, paper)

piece of clean glass

pieces of wood (smooth, rough, hard, soft)

various surfaces for striking matches (soles of shoes, blackboard, metal, plastic, etc., found in classroom).

III. aluminum plates of wax or paraffin (2)

candle

colored water

electric plate

flask and toy balloon

matches (kitchen)

metal ball and ring (science kit)

pan of water for heating

paper, (black and white pieces)

pennies (2) or identical keys

pinwheels (3) on strings tied to yardstick or apparatus bar at science table

rack tripod

spoons (all metal, wooden, plastic, metal with wooden handles, etc.).

test tube with rubber stopper and glass tubing

tongs

variety of objects for heating (cork, rock, nuts, pins, plastic key, nail, etc.)

PROBLEMS AND CONCEPTS	RESOURCES
I. How does heating and cooling produce changes in materials?	Wonderworld of Science, Book 3
A. Heat causes metals, liquids and solids to expand.	Pine and Levine, Heat All Around, 1963
	Arey, Science Experiences for Elementary Schools
1. A thermometer utilizes heat expansion of liquids.	Beauchamp, Science and Learning, Grade 2, 1961
2. Cooling causes contraction.	Filmstrips: "Thermometers" "Heat Makes Things Expand"
3. A sudden change in temperature can make some things crack.	
B. Heat changes foods in many ways.	
Some foods become softer.	
Some foods change color.	
Some foods become harder.	
Many foods change in taste when heated.	
II. How does heat travel?	Pine and Levine, Heat All Around, 1963, pp. 34-37
Heat travels in various ways.	Schneider, Let's Find Out
A. Heat travels in straight lines.	The Wonderland of Science, Book 3
	Freeman, Fun With Science
	Arey, Science Activities for Elementary Children, pp. 32-46
B. Heat travels quickly through metals because they absorb more heat. Metals are the best conductors of heat.	Filmstrips: "Heat Travels" "Heat and Temperature" "Finding Out About Things Around Us"

ACTIVITIES

I. See film "Heat and How to Use It" to see how heat makes things expand.

A. Experiments:

1. Hold metal ball so class can see it goes easily through a ring. Now heat the ball in a flame. Try to pass ball through ring. Let ball cool and try again. (Heat expands metal)

2. Hold a test tube, filled with colored water and corked with a rubber stopper with glass tubing, with tongs over candle flames. Have class watch what happens to colored water in the tube. Remove from flame and let cool. Observe what happens. (Heat expands liquids; a thermometer measures temperature.)

3. Place empty flask, with toy balloon over opening, on a rock over candle. Observe action of balloon. (A long balloon is more fun than a round one! What happens? Set aside to cool. What happens now? Why? (Heat expands air.)

4. Heat some marbles in a pan in the oven (450° for 30 minutes). Pour hot marbles into cold water. Observe. What happens?

B. 1. Heat foods and note changes.

2. Make a chart of common foods and how heat changes them.

II. A. Place a piece of cardboard between heat source and hand. Do the same using a piece of glass, a piece of metal, a piece of board. (Heat radiation) How does heat travel? Can you see why it is cool in the shade? What keeps the heat away from the shade? Would glass walls help make shade? Why do trees make better shade than a metal wall?

B. Place several kinds of spoons, silver, wood, plastic, in hot water and let children see how long they can hold onto the handles with comfort. Which handles got hot first?

Heat a pan of water on electric plate. Drop various objects into boiling water and boil for a few minutes. Remove with tongs and place upon a plate of wax or paraffin. Let cool. Children can observe which material holds the most heat.

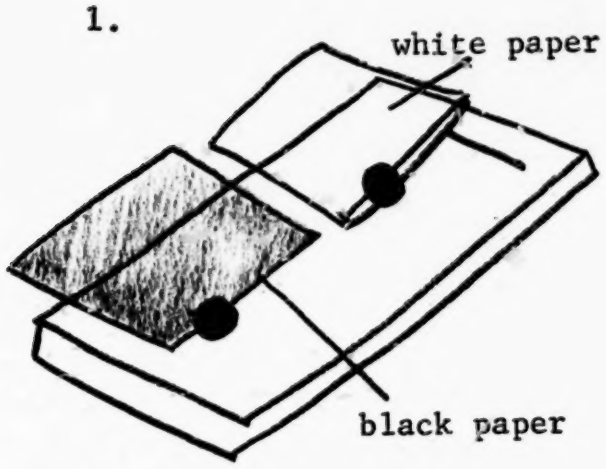
PROBLEMS AND CONCEPTS	RESOURCES
II. C. Heat travels slowly through wood and plastics, hence they make good handles.	
D. Heat can radiate or be absorbed.	Frazier, Seeing New Things
Dark colors absorb more heat than do light colors. Lighter colors reflect heat.	Frazier, Finding Answers, pp. 149-150
	Baer, Experiments Without Fire
	Filmstrips: "Finding Out About New Things Around Us" "Measuring Temperature"
E. Heat can travel with the help of wind. (Heat convection)	Science Far and Near, pp. 222-226
Air rises when it is heated.	

ACTIVITIES

II. C. Write up experiments about heat travels. Draw pictures to illustrate. Hold a bolt, a pyrex bottle, a piece of wood in a candle flame. Which one gets hot faster? The iron got hot faster for iron conducts heat faster. Discuss why pans are made of metal. Discuss why pans have wooden handles.

D. Have you noticed big gas storage gas tanks are painted white or silver? Can you guess why? Do you know why so many people paint their houses white? Why do people like to wear white in summer?

1.



Place two pennies (or two identical keys) on a plate of paraffin or wax. Cover one penny with black paper; cover the other with white paper. Set out in sun. Later examine to see which has absorbed the greater amount of heat. What does this show?

2. Make two little paper houses; one black, one white. Place each over an ice cube in sunlight. In a few minutes uncover to see which cube is larger. Which roof would you want on your house? A light one or a dark one?

E. 1. Fan the heat rising from an electric plate; let pupils see how far away they can still feel heat. What does this show? (Wind carries heat.)

2. Stand on a chair and see if you feel warmer or cooler. Why?

3. Place lamp, electric plate, and candle under pinwheels and let class watch what happens to the pinwheels. (Better if pinwheels are tied to science table bar so children can see that you are not moving the pinwheels.)

4. Can you hold your hand as near to the flame on the top as you can on the side?

PROBLEMS AND CONCEPTS	RESOURCES
III. Can we keep heat from traveling?	State Text for third grade, Science Far and Near, pp 213-217
A. Some materials are very poor heat conductors. These materials are valuable to people.	
1. Woolen clothes are warmer than cotton.	
2. Some materials keep heat or cold from passing through.	
3. Some materials lessen heat and make good protectors.	

III. Why are woolens warmer than other materials?

A. Fill four jars to the top with hot water and cover them tightly. Be sure the outside of the jars are dry. Pull the wool sock on one jar. Pull the cotton sock on another jar. Pull the nylon sock on the third jar. Leave the fourth jar as it is. Put in a cool place (not a refrigerator). Leave for thirty minutes. Remove the socks. Which is warmest? Which is coolest?

B. Read and work experiments in Science Far and Near to learn about insulation.

C. How do some materials keep heat or cold from passing through?

Wrap one piece of cloth tightly around a jar and another cloth loosely around another jar. Fill both jars with hot water and put lids on them. Let stand for fifteen minutes or longer.

Which jar keeps the water the warmer? Is the water in the tightly wrapped jar the warmer?

The loosely wrapped jar keeps the water warm longer because there is air trapped between the cloth and the jar.

D. Why are woolen clothes warmer than cotton?

Push a piece of wool down into a glass of water with a pencil. Do the same with a piece of cotton. Lots of air bubbles come up from the wool piece - not so many bubbles come up from the cotton piece. Not so much air is trapped in the cotton. More air is trapped in wool.

E. Visit a new house that is in early stages of building to observe insulation.

F. Why are some houses insulated?

Take a piece of insulation and put over a furnace. Test to see if the heat comes through.

Insulation makes our houses cooler in summer and warmer in winter.

SAMPLES OF PUPIL ACTIVITY SHEETS FOR SUMMARY

A.

balloon

dry flask

This proves that heat causes gases (air) to expand.

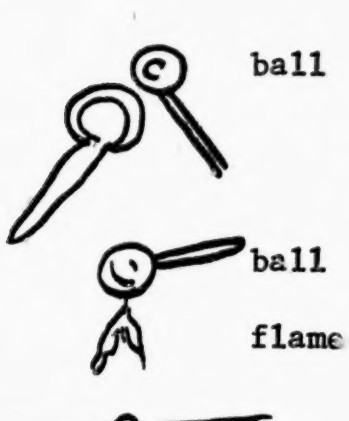
B.

cork

flask full of water

This proves that heat causes liquids (water) to expand.

C.



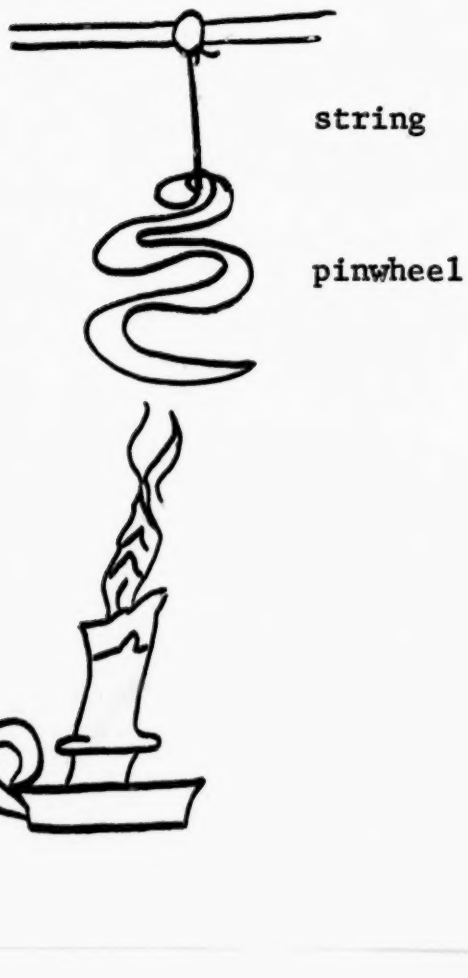
ball

ball

flame

This proves that heat causes solids (metal ball) to expand. (Cooling will cause gas, liquid, solid, to contract.)

D.



string

pinwheel

The pinwheel spirals proving that heat from a flame is carried upward by the air.

P. 77, The Wonderland of Science
Book 3, State Text, 1952

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SCIENCE GUIDE

Unit Geology

Grade Three

Fresno County Schools

HAROLD L. COLES, Superintendent

September, 1964

VOCABULARY

amounts

calcium

conglomerate

deserts

earth

expand

gneiss

granite

igneous

ingredients

limestone

marble

metamorphic

minerals

mountains

ocean

plains

sandstone

sedimentary

soil

surface

valleys

APPARATUS, EQUIPMENT AND SUPPLIES

bottles with screw on covers (2)

can with tight cover (such as a coffee can)

chisel

copper penny

crushed brick

glass (small piece)

glass jars (5-6)

hammer

ice tray

knife or steel file

magnifying glass

paper bag

pebbles

plaster of paris

rock collections from children

sandpaper

soda pop (small bottle)

soil (from garden, beach, woods, road cut)

white tile (small piece - kind used in bathrooms or for hot dishes)

INTRODUCING THE UNIT

Third graders like to make lists of things. Talk about places they have been. List the town, the states and the countries that our class has visited. Find these places on a map - and the globe. Compare size of the earth with the part we live in or have visited.

If the class has a garden or has planted flowers on the school ground start with soils and rocks. Take magnifying glasses out to examine soil. Notice rocks in soil. Find books that tell about rocks and soil.

Rocks are always fascinating to third graders. Ask each pupil to bring a rock to school on a certain day. Any kind of rock; just one. Have books open to rocks, have pictures of land formations on bulletin board and one or two good specimens on display. Group rocks as children suggest first day.

PROBLEMS AND CONCEPTS	RESOURCES
I. What is the earth?	Filmstrip:
A. The earth is a planet.	"Our Home, the Earth"
	Motion Picture:
	"Big Sun and Our Earth"
B. The earth is very large.	
II. What is our earth like?	A globe.
A. The earth has deserts, mountains, valleys, plains, islands, oceans.	A relief map of United States. Ginn, Science Everywhere, pp. 99-114 Singer Science Series, Finding Answers, pp. 7-12 Scott Foresman, Science Is Exploring, pp. 86-100 Fenton & Fenton, The Land We Live On, pp. 2-30
	Motion Pictures: "Big World" "Lands and Waters of Our Earth" "The Deserts" "The Mountains" "The Valleys"
B. The earth is made of land and water surrounded by air.	
III. What is under the land and sea?	State text, Science Far and Near, pp. 2-3 Scott Foresman, Science Is Exploring, pp. 100-101
A. Everywhere under the land and even under the sea, lakes, and rivers there is solid rock.	Motion Pictures: "Materials of Our World" "Surface of the Earth"
B. Soil covers most of the rock on the surface of the earth.	
C. There are tiny pieces of rock in the soil that once were part of huge mountains of rock.	Filmstrips: "Finding Out About Land, Air and Water"

ACTIVITIES

I. Use globe to show shape of earth and land and water masses.

A. Find commonly known places - Washington, D.C., California, etc.

Discuss trips taken by children; how they traveled; how long it took.

Recall trips of astronauts. How long?

B. Display post cards from distant places. Classify as water surfaces and land surfaces.

II. Use pictures of mountains, oceans, deserts, valleys, etc.

A. Make a bulletin board with pictures - label mountain, valley, etc.

1. Discuss San Joaquin Valley, Sierra mountains and Coast mountains.

Do we live in a valley? How can you tell?

Find our town of Fresno on the map.

2. Walk out into schoolyard, or to some place to observe land formations.

3. What are the earth's highest land surfaces?

4. Where is the highest place in the United States? In California?

5. Where is the lowest place in the United States? Try to find pictures to show. Ask mothers and dads about this.

B. Look at maps. Use symbols to locate mountains. Use a relief map of United States to locate mountains, plains, deserts, and oceans.

III. Find pictures of land under the water.

A. Discuss scuba diving. What do the divers see under the water? Have you seen movies or TV shows that show divers underwater?

B. Make finger paint pictures of rocks, shells, and plants underwater.

C. Make underwater dioramas inside box lids; use undersea scape for background; mount sea animals in 3-D manner; put sand, rocks and shells on bottom. Cover with cellophane.

PROBLEMS AND CONCEPTS	RESOURCES
	State text, Science Far and Near, pp. 4-6 Scott Foresman, Science Is Exploring, pp. 100-102
D. Soil is formed from rock that has been broken into small particles.	
E. There are different kinds and colors of soil. (clay, sandy loam, and loam)	
IV. How do sudden changes from hot to cold or cold to hot make some things crack and break? What other things wear them away?	
A. The sun makes rock crack and break. Most things expand when heated. (get bigger) Rock cracks because the sun makes the outside of rock expand more than the inside. This process can take millions of years, as do B, C, and D.	State text, Science Far and Near, pp. 7-10 Singer, Finding Answers, pp. 27-31 Filmstrips: "How the Earth's Surface Changes" "Rocks and How They Change"
B. Running water wears away rock. When water runs fast, it carries along bits of rock. These bits of rock wear away the rock in the bed of the stream. When water slows down, bits of rock are dropped in the stream bed.	State text, Science Far and Near, pp. 11-13 Filmstrips under A above apply here also.
C. Water which freezes in the cracks and crevices of rock expands and breaks rock apart.	State text, Science Far and Near, pp. 14-15

D. Collect a display of pictures showing different types of soil. (red, yellow, sand, etc.)

E. Do experiment, "Rock in Soil," - State text, Science Far and Near, p. 5.

1. Put several rocks into a can with a tight lid. Shake the can hard. Let several people shake it. Shake it many times, and then open the can. Have any rocks broken? What is there that wasn't there before?

2. Collect samples of soil from different places and put each sample in a separate jar. Exhibit and notice difference in texture and colors.

IV. A. Do experiment, "Heat Breaks Things," - State text, Science Far and Near, p. 8.

1. Heat marbles in a pan until they are very hot. Dump into cold water. What happens? Why? Crackled marbles are used for decoration.

2. Heat a small piece of quartz or feldspar until very hot; plunge into water.

3. Find pictures of land formation showing crevices and cracks.

B. Do experiment, "Water Moves Soil," - State text, Science Far and Near, p. 13.

1. Examine and explain round smooth rocks found in stream bed.

2. Find out what happens to bare soil in the rain. Spread some soil on a slanting board. Put a basin at the lower end. Sprinkle water at the higher end. What part of the soil washes down into the basin? Is it the soft dark material or is it the pebbles and sand?

C. Do experiment, "Ice and Rock." - State text, Science Far and Near, p. 14.

Do experiment, "Water Freezes," - State text, Science Far and Near, p. 15.

PROBLEMS AND CONCEPTS	RESOURCES
D. Wind wears away rock by blowing sand against rock. This takes a very long time.	State text, Science Far and Near, p. 17 Clifford and Carlson, The Wind Has Scratchy Fingers
E. Plants that can grow on rock soften the rock until it crumbles into soil. Fallen leaves and dead plants become part of soil. All soils have crumbled rocks in them and some have crumbled plants in them. There are many kinds of soil.	State text, Science Far and Near, pp. 18-20 Motion Picture: "Understanding Our Earth - Soil" Filmstrip: "Soil for Plants"
V. How are rocks formed and what are their uses?	
A. The Indians made their homes from the material they found around them. They used tools made of hard rock to cut soft rock.	State text, Science Far and Near, pp. 39-40
B. Some rocks are hard and some are soft. We use rocks for different purposes according to their hardness or softness.	State text, Science Far and Near, pp. 41-43 M. B. McCormack, The First Book of Stones, pp. 6-25

D. Do experiment, "Wind and Rock," - State text, Science Far and Near, p. 17.

1. Discuss sandstorms and effect of blowing sand.

2. Find out how farmers sometimes protect their fields from strong winds.

E. Look at soil through magnifying glass. Pick out rocks. What else is in soil? Try to find pieces of decayed plants in soil.

Plant seeds in different soils; clay, sand, loam, and leaf mold. Give each the same care and observe.

V. Have children brink rocks (each bring one) to school.

A. Display rocks. Discuss their uses. Make a list of things that Indians used rocks for; weapons (arrowheads), money, tools, mill for grinding, weights, etc. Do we use rocks?

1. Let children classify rocks as they believe they should be classified. (Probably color, weight, etc.)

2. Can you cut a rock with a rock? Try it. What kind of rocks will you need?

B. Make up a basic rock collection.

Children bring rocks they found. Label rocks telling where they were found.

Order a rock collection from A-V Department. Use to help classify rocks. (Some children have collections they will share.)

- invite a geology student to come in and help you identify your rocks.

- at first classify rocks as hard-soft, heavy-light, or by color.

- break some rocks apart to see how they look inside.

PROBLEMS AND CONCEPTS	RESOURCES
C. Rocks are made up of one or more minerals.	Podendorf, Rocks and Minerals, pp. 33-39
D. Sedimentary rock is made under water. Sandstone is made from grains of sand that have been pressed and cemented under the sea by the pressure of other materials above. It takes many years to make sandstone. It is an important building material. Limestone is made of shells and bones of sea animals. Limestone contains a large amount of the mineral called calcium.	State text, Science Far and Near, pp. 44-45, 115-128 Podendorf, True Book of Rocks and Minerals, pp. 19-27 M. B. McCormack, First Book of Stones, pp. 35-55 Motion Picture: "Rocks" Filmstrip: "Rocks and Minerals" Models: "Rocks - Basic" "Rocks and Minerals"
E. Igneous rock or fire rock. There are as many different kinds of igneous rocks as there are ingredients to make them. Granite is an igneous rock used in building.	M. B. McCormack, First Book of Stones, pp. 27-35 Podendorf, Rocks and Minerals, pp. 12-18
Metamorphic rocks. Metamorphic rock is rock that is made over by heat and pressure and sometimes water and chemicals. Granite changes into gneiss and limestone changes into marble. How is marble used today?	M. B. McCormack, First Book of Stones, pp. 56-61 Podendorf, Rocks and Minerals, pp. 28-32

C. Read to class the story "Why the Sea Is Salt." Discuss the mystery of the salt in the sea. See, Science Far and Near, pp. 102-105.

1. Do the salt experiment on p. 104. Try this same experiment with soda and sugar. Dip a string into the solution of each, let it dry. Observe crystals.

2. Do the teakettle experiment on page 106 and read page 105 in Science Far and Near to understand how rocks and soil send salt to the ocean.

3. With a magnifying glass observe a broken piece of granite. Observe the minerals that make up the rock; the glassy crystals are quartz minerals, the shiny specks are mineral mica, the black specks are hornblende, the dull white and pink bits are mineral feldspar.

   Ask a geology student to show some other rocks and point out the minerals.

D. Make a sedimentary rock. Use a milk carton - cut away one side and tape the spout down. You will need various kinds of rock particles - a cupful each: clean sand, gravel or pebbles, powdered clay (clay is mostly feldspar), powdered schoolroom chalk, plaster of Paris (made from gypsum), builders cement (mixture of several minerals), bits of shells. Fill the carton with water, sprinkle in sand and cement, let them settle and add another layer of any substance. Continue until the box is full. Experiment with different kinds of rocks. If you use mostly sand you will have sandstone, if you use lots of pebbles you will have a conglomerate rock. Experiment with different rocks and different colored chalk and clay.

1. Try the limestone experiment in Science Far and Near, p. 117.

2. Make a collection of sea shells - notice the way the clam shells are formed, feel the "stony material." Realize the "stony shell" was made of limewater. Read about it in Science Far and Near, p. 118.

E. Reclassify the rock collection. This time put the rocks into three classifications: igneous, sedimentary and metamorphic. Use rock collection from A-V to identify; find classification that each kind belongs to in First Book of Stones and other books listed under Resources.

PROBLEMS AND CONCEPTS	RESOURCES

ACTIVITIES

Other things to do:

1. Take a field trip to look for rocks. Make individual collections (use egg cartons or boxes squared off to paste rocks on).

2. Make a kind of sandstone by mixing crushed brick with sand, water, and a little plaster or cement.

3. Find some colored pictures of the Grand Canyon. Look at the layers of sandstone and other rock.

4. Make a chart of foods that have large amounts of minerals in them.

5. Make a class painting to show the travels of calcium from the sea and back to the sea.

6. If possible, take a trip to rock shop or a business dealing with rocks for commercial purposes to observe different types of rocks.

7. Make paper weights with rocks. Choose an interesting shape; add a little color to bring out figure or design.

8. Make a hot dish tile. Use plaster of Paris in a square or round greased receptacle. Pour in about 1/2" of plaster, press in selected rocks. Plan design before mixing plaster.

EVALUATION

1. Do the children realize that all kinds of soil contain bits of rock?

2. Do they understand that the bits of rock in soil were parts of huge mountains of rock, which were slowly broken up and worn away by sunlight, water, wind and plants?

3. Do they realize that most kinds of soil contain plant material?

4. Do they understand that soils differ in the amount of rock material and in the amount of plant material they contain?

5. Do they realize that soil provides us with most of our food?

6. Are the children beginning to understand that there are different kinds of rock in the earth's surface, and that different kinds of rock may be used for different purposes?

7. Do they begin to understand the broad implications of the limestone cycle, which is another of the many examples of the use, over and over again, of the materials of the earth?

8. Are they beginning to realize that the hardness, color and general "feel" of a rock helps to tell, in a general way, what kind of rock it is?

9. Do they have a general idea of how sedimentary, igneous and metamorphic rocks are formed, and do they realize that this process takes a long time?

10. Are they beginning to solve problems in science by:

    a. selecting contributing material?

    b. collecting data?

    c. recording results?

    d. drawing some conclusions?

    e. applying results to new experiences?

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SCIENCE GUIDE

Unit Chemical Change

Grade Three

Fresno County Schools

HAROLD L. COLES, Superintendent

September, 1964

VOCABULARY

baking soda

carbon

carbon dioxide

carbon monoxide

chemical change

chimney

complete combustion

draft

flame

fire extinguisher

fire safety

fuel

gases

hydrogen

ignite

incomplete combustion

inflammable

kindling temperature

new compounds

oxidation

oxygen

physical change

smog

smothering

vent holes

vinegar

water vapor

APPARATUS, EQUIPMENT AND SUPPLIES

A - B

aluminum plates - several

candles - tallow and wax

chimneys - 2 (see Science Activities for Elementary Children, Activity 123, p. 67 for making chimneys from jars)

cloth scraps

corks or little blocks of wood

electric light bulb on switch or a small lamp

glass baking dish - 2" or 3" deep

ice cubes

jars of various sizes - 3 paired jars and 1 quart size

matches - kitchen

pan for heating ice cubes, etc.

paper

sugar cubes

tongs

toothpicks or wood splinters

water

wood and a sharp knife

APPARATUS, EQUIPMENT AND SUPPLIES

C - D

aluminum plates with sand

candles

cardboard box - that will hold water - or a paper bowl

chimney

cigarette lighter

coffee cans - 2 - 2 lb. size cans

jars

pebbles

rack with wire mesh for heating

rubbish scraps (typical of incinerator dumpings: foil, bits of cloth, food scraps, paper folded like newspapers and magazines, metal pieces, leaves, etc.)

sodium bicarbonate - baking soda

twigs and sticks

vinegar

water - colored

wooden blocks or corks

INTRODUCING THE UNIT

Have you heard people talk about a physical change? A chemical change?

1. Turn on light, feel heat. Turn off, note change.
2. Burn a match; a piece of paper; a scrap of cloth; slivers of wood; a sugar cube. What were the changes?
3. Melt an ice cube; heat water to evaporate; condense steam back to water. How much change was there here?
4. Shave up some wood; cut up paper.

What happened to mother's good silver spoon when egg was left on it? Did it change? How?

What happened to the milk when it was left out of the refrigerator overnight? Did it change? Did it change in the way it looked? How did you know it had changed?

Where can we find out about change? Let's be scientists and find out.

PROBLEMS AND CONCEPTS	RESOURCES
I. What is a chemical change? Everything is made up of elements. If elements change into something entirely new by combining, it is a chemical change.	Meyer, Picture Book of Chemistry, 1950 (simple experiments) Straus, Let's Experiment, 1962 (children can use). Directions for a chemistry set, p. 5
A. Burning is a chemical change (oxygen is the main element in burning).	
1. Most burning is oxygen combining with another element to form new compounds such as: a. soot (carbon) b. carbon dioxide c. water vapor d. smoke	Motion Pictures: "Chemical Change" "Chemistry" "Fire" "Fire - What Makes It Burn"
2. For a fire to burn it must have; - fuel to burn - heat to start it - oxygen to keep it burning	
3. To extinguish a fire; - the fuel can be removed - fuel can be cooled below its kindling temperature - oxygen can be excluded (taken away) or used up	Thurber, Exploring Science, Book 3, pp. 48-60 Straus, Let's Experiment Virginia Mullin, Chemistry for Children

ACTIVITIES

I. Make up a chemistry set as described in Let's Experiment. Chemical changes are taking place all the time.

A. Make a list of chemical and physical changes found at home; at school; in our town; anywhere (a piece of toast, leaves that have turned brown, rusted iron).

1. Show motion pictures, "Chemical Change"; "Chemistry."

2. Experiments to discover the nature of burning and what a flame is. (Caution: All experiments that use a flame should be demonstrations by teacher.)

a. Show motion pictures, "Fire - What Makes It Burn"; "Fire."

b. Have children study parts of flame; a match; a candle; a lighter.

(1) Thrust a piece of paper into a flame about 1/4" above wick and then out. Note unscorched center and distinct scorched ring.

(2) Hold cold spoon in tip of flame. Note soot and moisture on spoon.

(3) Place clean dry jar over burning candle. Note moisture and carbon (soot) on jar top and sides.

(4) Leave a piece of bread in the toaster too long and note chemical change.

(5) Snuff out a candle and immediately hold a lighted match about one inch above the smoking candle. Note the jump of flame to the wick. Why did the candle relight?

(6) Place candle in a glass pan of colored water; mark level of water on side of dish by taping a toothpick at the water level. Light the candle and invert a quart jar over the lighted candle in the pan of water. Note what water does as the candle burns out. (Activity 51, p. 29)

3. Encourage children to be chemists. Try experiments.

Chemists keep careful notes. They use their imaginations and guess about the world. Then they experiment to see if they are right.

Place small, medium, and large jars over lighted candles. Note which candles go out first. Is there any relationship between the size of the jar and the amount of oxygen to burn?

PROBLEMS AND CONCEPTS	RESOURCES
4. A thing can change its form without a chemical change.	
B. Rusting is a chemical change. (It is *a* form of corrosion.)	Motion Picture: "Chemistry"
1. Rusting of iron is slow oxidation. -not all metals rust -painting prevents rusting by keeping oxygen (air and oxygen) away from iron	
C. Tarnish forming on silver is a chemical change. (a form of corrosion)	Beeler & Branley, Experiments in Chemistry Straus, Let's Experiment
D. Heat can cause chemical change in sugar and other things.	
E. Fermentation is a chemical change.	
F. Bleaching is a chemical change.	
II. How do some chemical changes help us?	Beeler & Branley, Experiments in Chemistry
A. Chemicals are important in fire safety.	Meyer, Picture Book of Chemistry Virginia Mullin, Chemistry for Children

4. Melt ice cubes. How did the form change? Could we change back to ice cubes? This is a physical change, but not a chemical change.

B. Take two nails. Shine with steel wool so the existing coat is removed. Cover one with colorless nail polish. Stand in a glass partly filled with water. Observe how nails rust. Try same using oil or vaseline on a nail.

Take two pennies. Shine them. Cover one with colorless nail polish. Observe in two or three days.

C. Egg whites, mustard or mayonnaise will tarnish silver very fast. These materials combine with oxygen in the air and form another material that we call "tarnish" on the silver. Put a silver spoon or fork into one of these and see what happens.

D. Make candy - fudge for example. What happens to the sugar?

E. Crumble half a yeast cake into a half cup of tepid water. Add to 5 cups of lukewarm water in which 1 cup of sugar has been dissolved. Let stand in a jug with a paper cup over opening. (Gases will form and lift the cup.) It will have an unpleasant odor.

Corn stored in silos undergoes fermentation.

F. Pour 4 drops of ink into a glass of water. Stir in a teaspoon of bleach and watch the change.

II. Place seed pods in the sun. Leave them for several days or weeks. The sun dried the pods causing them to crack.

Discuss the dangers of fire.

A. Experiments on fire safety:

1. Show motion picture, "Fire Safety Is Your Problem."

2. Demonstrate how fire can be extinguished:

a. Smothering - Light a piece of paper in an aluminum pan. Smother by placing another pan down tightly over the flames.
- Snuff out a candle.
- Press cloth down upon burning paper.

B. Foods are preserved.

C. Milk is used for many products by chemistry.

Casein is a milk product. Casein is one main ingredient in:

glue - paints
plastic - cloth
buttons - combs

D. Coal oil and water produce:

nylon, cellophane and hundreds of other synthetics

III. What are some harmful chemical changes? How can we avoid them?

A. Smoke is harmful.

1. Smoke is caused by fires not getting the right amount of air.

2. Bonfires or burnings may give off poisonous gases - especially carbon monoxide.

3. Smog is caused by smoke products floating in the air.

4. People can help get rid of smog and smoking incinerators.

b. Heat water in a cardboard dish over a flame. (set dish on a mesh on a rack)

Dump out the water and place back on the rack over the flame. Note how soon it scorches.

Why did the water keep the paper dish from burning?

c. Place lighted candle in jar. Let burn. Hold a lighted match over vinegar in a jar, then over sodium bicarbonate in another jar. Was there any reaction? Now add vinegar to the sodium bicarbonate and pour into jar with lighted candle. Quickly place on the lid and observe reaction.

The chemical action in this experiment is the same as that used in some of the older types of fire extinguishers.

III. Experiments to find out why some incinerators smoke:

A. On aluminum pans with sand in the bottom, build small bonfires. Have one properly built with the twigs stacked and the paper crumbled, etc., including having little pebbles to hold up the paper from the sand. Lay the paper, twigs, etc., of the second bonfire flatly on to the sand.

Light both bonfires at the same time. What happens?

B. Lay pieces of paper flat upon an aluminum plate. Lay equal sized crumpled pieces of paper on another plate. Light both. Do they burn equally? Is there any smoke? Should magazines and folded newspapers be placed into the incinerator?

C. Using a lighted candle in a jar with a top open; another lighted candle in a jar with a bottom opening; and another lighted candle in a chimney that is raised up by corks or blocks so there is an opening at both top and bottom, prove the value of having a draft for clean burning.

Which candle smoked the most? Which went out? Which burned clean?

D. Using two equal coffee cans, simulate two incinerators. Vent one with nail holes on bottom as well as on the sides. Place vented can upon pebbles in an aluminum pan with sand. Place the other can directly on to the sand in another aluminum pan.

Place equal trash into both coffee can incinerators. Light and watch the rate of burning in each can; the cleanness of the flame; the completeness of the trash in each can. Decide which items would be better carted off by the rubbish collector or buried.

E. How might classes at school help with the complete burning in the school incinerator?

TELL WHETHER IT IS A PHYSICAL CHANGE OR A CHEMICAL CHANGE

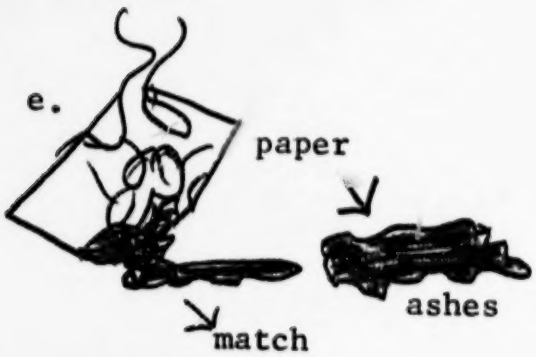
a. Physical ✓
Chemical

c. Physical
Chemical ✓

b. Physical
Chemical ✓

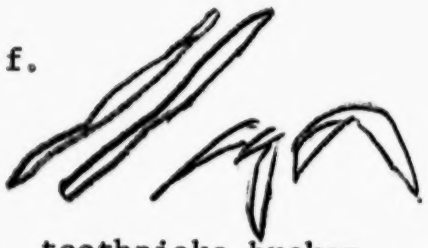
d. Physical ✓
Chemical

on off



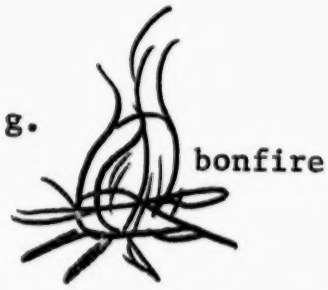
e. paper match ashes

Physical
Chemical ✓



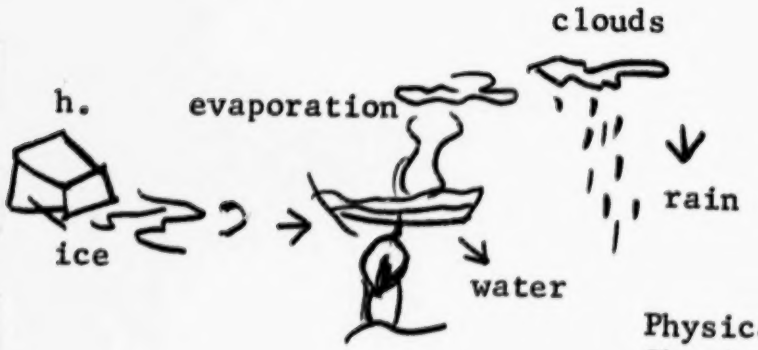
f. toothpicks broken

Physical ✓
Chemical



g. bonfire

Physical
Chemical ✓



Physical ✓
Chemical

A Physical Change = a substance can change its looks and form without changing its chemical composition.

A Chemical Change = new compounds are formed. Heat is generated during the change.

pp. 40-43, The True Book of Chemistry

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SCIENCE GUIDE

Unit Animals

Grade Three

Fresno County Schools
HAROLD L. COLES, Superintendent
September, 1964

INTRODUCING THE UNIT

Children are always bringing in specimens of animals. This provides a good time to talk about them. Their interest is great. Many questions will be asked. This is a good time to talk about one of the third grade concepts.

Out of these discussions you will know what books, films, charts, etc., to order to carry out your unit.

VOCABULARY

ADAPTATION - an adapting or fitting. Something made by adapting.

AMPHIBIAN - an animal living both on land and in water. Frogs are amphibians.

ANIMALS - one of two kinds of living things in the world, the other kind being plants. Fish, frogs, and earthworms are animals as well as cows and dogs.

ANTENNAE - an insect's feelers. They look like stiff hairs and are attached to the insect's head.

BACKBONE - the main bone along the middle of the back in man, mammals, birds, reptiles, and fishes.

BIRD - an animal that has wings and feathers.

BLOWHOLE - a nostril or spiracle in the top of the head of a whale or other cetacean.

CARBON DIOXIDE - a heavy, colorless, oderless gas, present in the atmosphere. The air that comes from an animal's lungs contains carbon dioxide.

CHRYSALIS - what a caterpillar changes into. Later the chrysalis changes into an adult insect.

COCOON - a blanket of silk thread in which some caterpillars wrap themselves. It is the pupa of some insects.

COLD-BLOODED - having blood that is about as cold as the air or water around the animal. Lacking in feeling. Turtles are cold-blooded; dogs are warm-blooded.

COLORATION - use or combination of colors; color pattern.

DIFFERENCE - the way in which people or things are different.

ENVIRONMENT - surrounding things, conditions, or influences.

FEELERS - something that feels. A cat's whiskers are its feelers.

FEMALE - girls and women are females. Cows are female cattle. A doe is a female deer.

FIN - one of the movable winglike or fanlike parts at the sides and tail of a fish with which it moves the water in swimming and in balancing itself.

FLOCK - a group of animals of one kind, keeping, feeding, or herded together.

GILLS - a part of the body arranged for breathing in water. Fish, tadpoles, and crabs have gills.

HABITAT - a place where an animal or plant naturally lives or grows.

HIBERNATE - to spend the winter in sleep, as bears, woodchucks, and some other wild animals do.

INSECTS - any of a group of small invertebrate animals with the body divided into three parts, with three pairs of legs, and usually two pairs of wings. Flies, mosquitoes, gnats, and bees are insects.

INVERTEBRATE - without a backbone.

LARVA - early form of an insect from the time it leaves the egg until it becomes a pupa. A caterpillar is the larva of a butterfly or moth.

LIKENESS - resembling; being alike.

LUNGS - a pair of breathing organs found in the chest of man and of other animals with backbones. By means of the lungs the blood receives oxygen.

MALE - person or animal that can be a father when it is grown up. Boys and men are males. A bull, a rooster, and a he-goat are all male animals.

MAMMAL - an animal with a backbone that gives milk to its young. Human beings, horses, dogs, lions, and whales are all mammals. Also give birth to their young.

MIGRATION - to move from one place to another.

MOLLUSK - an animal with a soft body, usually protected with a shell. Snails, oysters, and clams are mollusks.

OCTOPUS - means eight-footed.

OXYGEN - a gas without color or odor that forms about one fifth of the air. Animals and plants cannot live without oxygen.

POULTRY - chickens, turkeys, geese, ducks, etc.

PUPA - a stage in the life of an insect when it is in a case. It comes between the larva (caterpillar) and the winged adult stage.

REGULATE - control by rule.

REPRODUCE - produce offspring.

REPTILE - cold-blooded animal that creeps or crawls. Snakes, lizards, turtles, alligators, and crocodiles are reptiles.

SCALE - one of the thin, flat, hard plates forming the outer covering of some fishes, snakes, and lizards.

SCHOOL - a large number of one kind of fish or aquatic animals swimming together.

SILK - a fine soft thread spun by silkworms.

SIPHON - any of various tubular organs in animals, as in some mollusk for drawing in or ejecting fluids.

SPAWN - the eggs of fish, frogs, shellfish, etc.

SPINNERET - an organ for producing a thread of silk from the secretion of the silk glands, as in spiders and certain caterpillars.

SPIRACLE - a breathing hole; blowhole; vent.

TADPOLE - very young frog or toad, at the stage when it has a tail and lives in water.

TEMPERATURE - degree of heat or cold.

THORAX - the part of the body between the neck and the abdomen. A man's chest is his thorax.

TRANSPORT - to carry from one place to another.

VENOM - the poison of snakes, spiders, etc.

VERTEBRATES - having a backbone, or spinal column.

WARM-BLOODED - having warm-blood. The temperature of warm-blooded animals is from 98 degrees to 112 degrees. Cats are warm-blooded; snakes are cold-blooded. Have much feeling.

APPARATUS, EQUIPMENT, AND SUPPLIES

aquarium
animal cage
ant colony
bird bands
birdcage
cheesecloth
coat hangers
fish bands
gummed brown paper
magazines which may be cut up for pictures
magnifying glass
microscope and slides (insects)
mounted animals
outline maps of: world - North America
plaster of paris
screen wire
showcase - celluloid covered box
(celluloid may be purchased at auto supply stores)
specimens
window glass

PROBLEMS AND CONCEPTS	RESOURCES
I. Animals Adapt to Winter Seasons	
A. Some animals sleep all through the winter.	**Books:** Sarasy, Winter-Sleepers Life Nature Library, The Mammals, pp. 123-133 Ress, Field and Meadow, pp. 27, 32,37 *Disney, Beaver Valley, pp. 23,24 *The Wonderworld of Science, pp. 50-59, Book 2 Lathrop, Let Them Live, p. 12 Disney, Secrets of Life, pp 49, 97 Mose, The World of Ants *McClug, Whitefoot Allen, Everyday Animals Zim, Snakes Hoke, The First Book of Snakes, p. 28 *Disney, Bear Country, pp. 4, 8 Williamson, The First Book of Mammals, pp. 32-39
B. Some animals store food for the winter.	**Books:** Sarasy, Winter-Sleepers *Disney, Beaver Valley *McClug, Whitefoot *Adrian, Gray Squirrel **Filmstrips:** "Common Animals of the Woods" **Movies:** "Gray Squirrel" "Adapting To Change In Nature"

*Books that children at this grade level can read.

ACTIVITIES

I. A. Show a chrysalis of a butterfly and cocoon of a moth.

Discuss the hibernation habits of bears in dens, frogs and toads in mud, snakes under rocks and logs or in holes in the ground, squirrels in nests or hollow trees. Include how some bats may hibernate in caves during long periods when food is scarce.

B. Write stories about the animals and the food they store. Include such animals as bees, squirrels, beavers, and chipmunks.

Find pictures of a wasp nest, beehive, termites, ant colony, and beaver colony.

Make an ant house using a milk bottle or glass jar. Fill three-fourths full of ant hill and ants; add small amount of sugar. Place small piece of cloth or sponge on dirt to absorb teaspoon of water added occasionally. Cover top with cloth. Wrap black paper around jar or bottle so ants will tunnel next to glass where they can be observed. Remove paper only for short periods of observation.

PROBLEMS AND CONCEPTS	RESOURCES
II. Animals Have Many Adaptations which Help Them to Survive	
A. Some animals run or move swiftly.	**Books:** *Goudey, Here Come the Deer, pp. 16-18 *Brown, Young Kangaroo *Hogner, Boldy *Golden Press, The Golden Book of Animals Zim, Snakes *Earle, The Octopus, pp. 40-43 *Schwartz, Cottontail Rabbit, pp. 40-44 *Disney, The Vanishing Prairie, pp 16-17 Hogner, Grasshoppers and Crickets, pp. 3-6 Swain, Insects Unitext *Taber, The First Book of Dogs *Blough, Animals Round the Year *Parker, Animals We Know **Filmstrips:** "Woodland Neighbors" "Woodland Friends" "Large Zoo Animals" **Recordings:** "Kangaroos" (S610-C1)

ACTIVITIES

II. A. Discuss the ability of the deer to run fast.

Discuss the ability of the kangaroo to run fast.

Discuss animals running away from attacking animals or man.

PROBLEMS AND CONCEPTS	RESOURCES
II. B. Some animals have protective coloring and covering.	**Books:** *Goudey, Here Come the Deer, pp. 3-9 *Disney, Beaver Valley, p. 27 Sarasy, Winter Sleepers, p. 9 *Sears, Tree Frog, pp. 10-12 Life Nature Library, The Reptiles Life Nature Library, The Insects, pp. 101-120 Life Nature Library, The Sea, pp. 124-127 Life Nature Library, The Fishes, pp. 136-139 Zim, Snakes *Green, Animal Masquerade *Earle, The Octopus, pp. 18-23 Brown, Handbook of California, Birds Unitext *Williamson, The First Book of Birds **Films:** "We Explore Ocean Life" "Animal Adaptations" **Filmstrips:** "How Do Insects Protect Themselves" **Study Prints:** "Homes and Habits of Wild Animals" "Homes and Habits of Animals"

II. B. Discuss the spots on fawns and the white under part of their tails used for signaling. Why does a fawn have a red coat? Looks like pine needles.

Observe that toads are hard to find because they change colors. Some toads can change color from green to gray-brown. They are colored like their surroundings. Some toads are the color of the ground; some are green.

If possible have children bring chameleon to the classroom. Watch it change color to suit its environment.

Collect colored pictures of butterflies and moths. Observe their colors. Think about environment in which they live. How do their colors help to protect them?

Animals in cold climates change color or have colors like their surroundings. Animals such as the polar bear, artic hare, and weasel are examples. Find pictures and show on map where these animals live. Why does white and thicker covering help to protect them?

Discuss the hard covering of a mollusk. Why would this covering afford some protection?

PROBLEMS AND CONCEPTS	RESOURCES
II. C. Some animals migrate in groups.	**Books:** *Delafield, Mrs. Mallard's Ducklings *Phlegar, The Whales Go By *Disney, Seal Island Sterling, Spring is Here, pp. 62-65 Ress, Field and Meadow Life Nature Library, The Fishes, pp. 149-167 Life Nature Library, The Birds, pp. 99-116 Life Nature Library, The Mammals, pp. 121-131 **Filmstrips:** "Birds Grow" **Films:** "Animals That Fly" "Birds in Your Backyard" **Recordings:** "Flying Birds" (RCA S315-C2) "Garden Varieties" (S64-C4) "Eagle and the Thrush" (S198) "A Field Guide to Western Bird Songs" (LPa469) "American Bird Songs" (Sa256) **Study Prints:** "Common Birds" "Moths and Butterflies" "Traveling With Birds"

II. C. Discuss the migration of Monarch Butterflies.

Ask children to give reasons that might prompt wandering animals to travel. They may be prompted by local overpopulation, a need to avoid severe weather, and shortage of food. Help children to think through other stimulus that might cause man to wander, which does not occur in any other animal. Curiosity or the desire to conquer some challenge.

Discuss the fact that there are even now nomad people in the world. Talk about how people from all over the world migrate to the U.S. and even to California.

Point out that the African elephants will move into the forests to escape the dry seasons on the plains.

Discuss how some bats from Canada may fly as far south as the Bermudas.

Watch for flocks of birds in the fall and spring. Which way do they go in the fall? Which way do they go in the spring?

Make a list of birds in your community. Find out from this list which ones do not migrate.

Notice that English sparrows, blue jays, and crows live in the same place all year.

Discuss migration routes. They are wide pathways, following north-south coast lines, mountain ranges or river valleys. Some species usually follow the same route, year after year. Point out on the globe such flights as the bobolink from Canada to Brazil. Show children colored pictures of these birds.

Talk about the non-stop flight of the hummingbird across the Gulf of Mexico, a distance of 500 miles.

Discuss what might hamper the flight of these birds, such as rain, snow storms, and wind. Discuss the possibility of birds being hurt in flight. Reasons being, hitting in flight, tall buildings, telephone and electric power lines, monuments, lack of food they need or being caught by enemies.

Discuss the migration of certain species of fish. Salmon are schooling fish. Why do they return to the place where they were born? Stress the fact that this is their one and only purpose. Point out on map the pathway of the chinook salmon on their 700 mile trip to and beyond the Queen Charlotte Islands and back to their "mother" river. Discuss the aluminum bands developed by the U.S. Fish and Wildlife Service. If possible get a band or show pictures of different sizes. These are shown on page 115 in The Birds.

Discuss fish tags and why they are used. Different tags can be seen on pages 150-151 in The Fishes. See if tags can be obtained from U.S. Fish and Wildlife Service.

PROBLEMS AND CONCEPTS	RESOURCES
II. D. Some animals build nests to protect their young.	**Books:** *Delafield, Mrs. Mallard's Ducklings *McClug, Whitefoot Pettit, The Web of Nature, p. 33 Life Nature Library, The Insects, pp. 171-176 Life Nature Library, The Birds *Schwartz, Cottontail Rabbit, pp. 15-19 *Earle, The Octopus, p. 37 *Leyson, Manty the Mantis Unitext *Williamson, The First Book of Birds **Films:** "Animal Habitats" "Animal Homes" **Filmstrip:** "Woodland Neighbors" **Study Prints:** "Life in the Wild"
E. Some animals carry their new born after birth.	**Books:** *Brown, Young Kangaroo Sterling, Spring is Here Life Nature Library, The Mammals *Kangaroos and Other Animals Darling, With Pockets **Films:** "Animal Homes" **Filmstrips:** "Woodland Friends" "The Golden Book of Animals" "Common Animals of the Woods"
F. People help protect animals.	**Books:** Pettit, The Web of Nature Life Nature Library, The Reptiles, Life Nature Library, The Sea

II. D. Pull an old abandoned bird's nest apart. List materials used.

How do animals suit their homes to the environment? What materials do they use? How does environment affect the materials used?

Make a booklet showing animals that make their homes in the ground, on top of the ground, in swamps, and in trees.

E. Find pictures of mothers carrying their young. Include bats, opossums and kangaroos.

F. Discuss wild life in national parks, reserves, and refuges; about hunting and fishing regulations; and how lakes and rivers are stocked with fish. Discuss how animals in cities are protected by people. Get information from your Society of Prevention of Cruelty to Animals.

PROBLEMS AND CONCEPTS	RESOURCES
II. (continued)	
G. Some animals bluff.	Books: Life Nature Library, The Mammals, pp. 112-113 Life Nature Library, The Reptiles, pp. 162-166 Ballard, The True Book of Reptiles, p. 33 *Penn, Unusual Animals of the West Filmstrip: "Woodland Friends"

II. G. Discuss how some animals such as the opossum is one of the best at playing dead. A dog can easily catch one but if the opossum plays dead it will usually not be molested.

Collect pictures of small animals that fight back in desperation, or even feign death. Such animals are the cottontail. He kicks hard with his hind legs. The shrew will hump his back, grate teeth, squeak in a high pitch; then collapse on its back. The honey badger, striped hyena, and jackal may also faint or play dead.

PROBLEMS AND CONCEPTS	RESOURCES
III. Animal Young are Cared For in Different Ways.	Books: *Goudey, Here Come the Deer, pp. 10-18 Rees, Field and Meadow, p. 61 *Brown, Young Kangaroo *The Wonderworld of Science, Book 3, pp. 111-134 *Delafield, Mrs. Mallard's Ducklings McCracken, Hoofs, Claws, and Antlers, p. 18 *Hoke, The First Book of Snakes, pp. 31-33 *McClug, Whitefoot *Sears, Tree Frog, p. 25 Allen, Everyday Animals Williamson, The First Book of Mammals, pp. 50-59 Ballard, The True Book of Reptiles, pp. 44-46 *Earle, Camels and Llamas *Phlegar, The Whales Go By *Disney, Seal Island, pp. 24-27 Disney, The Living Desert, pp. 24-25 Disney, Bear Country, pp. 7-15 National Geographic, April, 1964, p. 510 *Lindop, Jumbo, King of Elephants Scott, Foresman & Co., Science is Experimenting, p. 36 Life Nature Library, The Sea Life Nature Library, The Birds Life Nature Library, The Mammals, pp. 151-162 Life Nature Library, The Reptiles Life Nature Library, The Fishes, pp. 110-117 Unitext *Williamson, The First Book of Birds Films: "Baby Animals" Filmstrips: "Pride the Saddle Horse" "Birds Grow" "The True Book of Birds" "Woodland Friends" "Animals to Know"

ACTIVITIES

Discuss how the mother deer protects her baby.

Talk about how the mother kangaroo cares for her baby.

Compare the care of these babies with the care of our babies.

Ask how a wasp may care for her babies. She puts a spider or other insect into the nest for food. Read Living Desert by Disney.

Talk about how the task of caring for some young fish falls upon the father.

Discuss the different ways mothers have of transporting their brood. A baby raccoon is carried like a cat, a beaver cradles its baby in its arms like we carry humans, a monkey curls her baby under her belly. A baby monkey grips tightly as the mother monkey curls him under her belly. A baby pangolin digs its claws into his mother's tail. If danger comes she curls up around him. Baby opossums hang on with feet and tail as she carries them. The shrew leads hers single file as the little ones mouth a tuft of fur on the rear of the one in front of it.

Discuss how maternal care is highly developed among mammals. If possible show how a mother elephant helps her baby who has an injured knee. This is on page 160 and 161 in The Mammals.

Discuss how mammals are set apart from other animals in the lavish care they give their babies. Mammals need childhood - they need and get a period of play and development.

Help the children to develop a booklet showing the care of the young of mammals as compared to the care given the young of fish, amphibians, reptiles, and birds.

Visit the zoo to see mothers and their young.

PROBLEMS AND CONCEPTS	RESOURCES
III. Animal Young are Cared For in Different Ways. (Continued)	Recordings: "Three Little Pigs" (S240-C4) "Night Owls" (S77-C3)
IV. Mammals are Covered With Hair, Feed Babies Milk From Own Bodies, Breathe With Lungs, and Are Warm-Blooded.	Books: McCracken, Hoofs, Claws, and Antlers, p. 18 Science Far and Near, p. 146 *King, Mabel the Whale *Goudey, Here Come the Dolphins *Phegler, The Whales Go By *McClug, Whitefoot Eberle, Fawn in the Woods *Newell, Polar Bear Brothers *Schwartz, Cottontail Rabbit Disney, The Vanishing Prairie Disney, Bear Country *Adrian, Gray Squirrel *Allen, Everyday Animals *The Golden Book of Animals Craig, Science for the Elementary School Teacher
	Filmsstrips: "Pride the Saddle Horse" "Woodland Friends" "Learning About Mammals" "Animals Grow and Change" "The Zoo" "Let's Go to the Zoo" "How Animals Live" "Animals to Know"
	Recordings: "Marine Life" (LP 51-C2) Standard Oil Company record "The Elephants" also "March of the Lions" (S610-C1)
	Study Prints: "Wild Animals" "Friendly Animals"

ACTIVITIES

Discuss what makes the mammals warm-blooded. Mammals are warm-blooded because they make heat in their bodies. The heat is made by the food they eat. Fat is a food that can make more heat than any other kind of food.

Collect pictures of foods that make fat such as butter, cream, nuts, meat, fish, and chocolate.

Collect pictures of the different sea mammals: Whales, manatee, dolphin, sea otter, porpoise, and seal.

Compare a sea mammal with another mammal. List all the ways in which they are alike and different.

Discuss how animals are arranged into groups according to their parts. All mammals are alike in certain ways, which makes it possible to group them together.

Put pictures or labels with strings attached to pictures of different animals on outline map of the world or North America to show part of world in which each is found.

Make a class painting of undersea life.

Let children draw upon their past experiences with animals to classify certain animals as having fur or hair.

Let the children look at their arms and note the hair or fuzz. What class of animal would man's skin covering put him in?

Gather information as to the benefit of hair. What good is it for warmth, protective coloration, and adornment? Is this a benefit to mammals?

PROBLEMS AND CONCEPTS	RESOURCES
V. All Animals Need Oxygen to Live.	**Books:** Williamson, The First Book of Mammals, p. 14 *Sears, Tree Frog, p. 7 Hogner, Spiders, p. 9 Brouillette, Insects, p. 13 Science Far and Near, pp. 141-142 Life Nature Library, The Sea, pp. 147-148 Scott, Foresman & Co., Science is Experimenting Ballard, The True Book of Reptiles Life Nature Library, The Reptiles, p. 119 Unitext Blough, An Aquarium **Films:** "We Explore Ocean Life" "Care of Pets" **Filmstrips:** "Air About Us" "How Animals Get Air" "Air Around Us" "My Pet Canary, Dickie" "Animal Homes" **Study Prints:** Tidepool Marine Life **Specimen:** Sea Horses

ACTIVITIES

Discuss how all animals have this basic need of oxygen to live.

Discuss a mammal that lives in the water. How does it breathe? Show pictures of the whale. Nostrils are located at the very top of the head and have become one or two blowholes which enable the whale to breathe without raising itself more than a few inches above the water's surface.

Discuss how other water animals meet their need for air.

Talk about how mammals take air in through their mouth and nose. Then the air goes into the lungs.

Show that mammals need less oxygen when they lie quietly. Jump up and down or run around. Do you breathe slowly or quickly? Do you use more oxygen when you lie quietly or when you jump up and down or run around? Frogs need less oxygen when they are quiet.

Collect some insects. Place a few in a small jar and screw lid on tightly. Place others in a similar jar having a perforated lid. In which jar do the insects live longer? Why?

Insects breathe through holes on the sides of their bodies. Obtain a grasshopper and observe the breathing hole on each segment of its body through a magnifying glass. Also discuss the spider family.

Discuss and list animals that breathe air and those that breathe "water."

Discuss care used in covering pets so that they may get enough air.

Talk about how parents and children must be careful that baby brother or sister gets enough air.

Discuss how some animals take in oxygen through the skin. Talk about how amphibians depend greatly on the skin for their oxygen How it must live in moist habitats so the skin won't dry out.

Discuss how the fish breathes by taking water into its mouth. The water flows over a structure called the gill and then passes out through an opening in the side.

Clam's gills are located inside the shell. It sends up a long siphon. It is a double tube with long hairs that wave back and forth. The siphon has two holes. Water enters one hole and comes out the other. As the water passes the gill it takes the oxygen that is needed.

Discuss dangers of discarding refrigerators and plastic garment bags.

PROBLEMS AND CONCEPTS

VI. Animals Depend on Plants and Other Animals for Food.

Books:

Pettit, The Web of Nature, pp. 24-25
Mose, The World of Ants
*Douglas, Round, Round World
*Sears, The Firefly
*Sears, Tree Frog
*Earle, The Octopus, pp. 33-36
Disney, Vanishing Prairie
*Schwartz, Cottontail Rabbit, 20-24 and 40-44
*Hogner, Spiders
*McClug, Whitefoot
Zim, Snakes
Bevans, The Book of Reptiles and Amphibians
Block, Dinosaurs
Williamson, The First Book of Mammals, pp. 15-23
Selsam, How Animals Eat
*Hurd, Starfish
*Huntington, Let's Go to the Seashore

Unitext
*Williamson, The First Book of Birds

Filmstrips:

"Woodland Neighbors"
"Woodland Friends"
"Learning About Birds"
"The True Book of Birds"

Films:

"Animals That Fly"
"We Explore Ocean Life"

Recordings:

Burl Ives, The Little White Duck, (S23-C5)
Standard Oil Company, Insect Life, LP50-C1
The Crawdad Song, (S240-C4)
The Crow Song, C77-C3)

ACTIVITIES

Discuss how some animals are cooperative in hunting. The wolves and their allies regularly run in packs. They are able to bring down large animals such as the moose.

Hunting associations between the coyote and hare often occur around prairie dog towns.

Lions on the African plains sometimes cooperate. They do not run in packs but sometimes four will hunt together. Their strategy is deliberate and organized.

Discuss how spiders catch food with their webs.

Collect and mount a spider web:

> Use two panes of window glass, about 10 by 12 inches.
> Gummed brown paper, about 1/2 inches wide.
>
> First frame the edge of one pane of glass with gummed paper. Thickness of paper will keep the glass a little apart from the second pane.
>
> Press the second glass very gently against center of the web. The threads will stick to the glass. With great care, fit the first glass against the second. Seal the edges together with strips of gummed paper.

Discuss eating habits of migrating birds. Many small birds travel by night. What are the advantages of traveling at night? Finding food in the daytime and escape from enemies at night.

Some birds fly without stopping. The night hawks and swifts open their mouths in flight as they fly through swarms of insects and thus get their food without stopping.

PROBLEMS AND CONCEPTS	RESOURCES
VII. Animals Reproduce Their Kind.	
A. Some animals hatch from eggs.	Books: Zim, Snakes *Sears, The Firefly *Sears, The Tree Frog Bevans, The Book of Reptiles and Amphibians *Shuttlesworth, The Story of Spiders *Ballard, The True Book of Reptiles, pp. 44-46 Hoke, The First Book of Snakes, p. 32 Hogner, Spiders, pp. 34-36 *Geis, The How and Why Book of Dinosaurs *Pistorius, What Dinosaur Is It? Dickinson, The First Book of Prehistoric Animals Zim, Dinosaurs Life Nature Library, The Reptiles, pp. 135-144 Life Nature Library, The Fishes, pp. 107-111 Darling, Turtles Filmstrips: "Finding Out How Animal Babies Grow" "The Turtles" "Learning About Birds" "Animal Babies" "Animals and Their Young" "Learning About Reptiles and Learning About Amphibians"
B. Some animals are born alive.	Books: National Geographic, p. 510, April, 1964 *McClug, Whitefoot Eberle, Fawn in the Woods *Keen, The How and Why Wonder Book of Wild Animals *The Golden Book of Animals *Darling, Kangaroos and Other Animals with Pockets *Allen, Everyday Animals

ACTIVITIES

Collect pictures of birds and poultry showing hatching and growth.

Have children make a diorama showing the environment in which reptiles lay their eggs.

Encourage children to visit a fish hatchery with their parents when possible.

Do all fish hatch from eggs? Are all water animals fish? Most fish hatch from eggs, but the guppies are born alive.

Point out that most reptiles hatch from eggs but that some are born alive.

Have children bring a turtle, lizard and snake for examination. What kind of skin do they have? Where can they be found?

Observe how reptiles look like their parents. They are covered with scales or plates, have short legs or no legs, breathe with lungs, are cold-blooded, and have a backbone.

Have children develop a pictorial chart on scaly animals: "These Scaly Animals Live in Water" and "These Scaly Animals Live on Land."

Discuss how birds look like their parents. They have two wings, two legs, no teeth, breathe with lungs, are warm-blooded and soon have feathers.

Collect pictures of different birds. Discuss helpful and harmful birds. Observe birds in the neighborhood. Read and write stories about them.

Observe difference in size, feathers, wing spread, and beaks. Do they walk or run?

Discuss beauty and value of birds.

Have children make a pictorial chart titled: "These Birds Fly" and "These Birds Do Not Fly."

Discuss mammals and how they are born. Help children to see that mammals are born alive.

Help children to decide which animals grow up quickly and which ones take a long time.

PROBLEMS AND CONCEPTS

C. Some animals go through stages of growth.

RESOURCES

Books:

*Sears, The Firefly
*Sears, Tree Frog, pp. 26-36
Mathewson, Reptiles and Amphibians
Brouillette, Insects
*Zim, Frogs and Toads
Swain, Insects
Lavine, Wonders of the Beetle World
*Smith, Western Butterflies
*Barlowe, A Child's Book of Insects

Unitext

*Blough, The Insect Parade
*Parker, Spiders
*Parker, Six-Legged
*Neighbors
*Tibbets, The First Book of Bees

Filmstrips:

"Butterflies Grow"
"Big Green Caterpillar"
"Insects Around Us"

Films:

"Wonders in Your Own Backyard"

Slides: (2X2)

"Butterflies"
"Life of the Swallowtail Butterfly"
"Spiders"

Recordings:

"The Creepy Crawly Caterpillar"
"Twenty Froggies" (S77-C3)
"Turtles"(S610-C1)

Charts:

"Life Cycle of a Frog"

ACTIVITIES

The young of many amphibians do not look like the adult. Amphibians live on land and in water, covered only with skin, breathe with gills primarily in the tadpole stage and with lungs in the adult stage, lay eggs from which young are hatched, are cold-blooded, and have a backbone.

Help children develop a pictorial chart of the life cycle of a frog or toad.

Insects grow in four stages; eggs, caterpillar (skin splits when caterpillar grows too large-moulting), chrysalis, butterfly emerges.

Have a field trip, if possible, to collect caterpillars or cocoons.

Make an insect cage. Add a layer of damp soil, and furnish the caterpillars the same leaves on which they were found. Furnish some twigs for the attachment of the cocoon. Note when they first begin to spin a cocoon. Mount the three stages of the growth of the insects in a cigar or candy box.

Insect Cage:
Bend screen wire into a large enough circle to fit over an aluminum pie tin. Overlap the edges of the wire and lace with finer wire. Pour plaster of paris into the bottom of the pie tin and when it begins to harden, place a twig into the center for a stand. Use another pie tin for the cover.

Coat Hanger Insect Net:
Take a coat hanger and bend into a circle. Fasten it to a wooden handle. Attach a piece of cheesecloth or a nylon stocking for a net.

Grasshoppers, crickets, and termites grow in three stages: eggs laid in ground, nymph hatches, wings grow as nymph grows.

Find pictures to show development of grasshoppers and termites.
Discuss damage done to crops by grasshoppers and damage to buildings by termites.

PROBLEMS AND CONCEPTS	RESOURCES
VIII. Many Animals Should Be Protected Because They Are Helpful To Us.	**Books:** Rees, Field and Meadow Huntington, Let's Go Outdoors *Earle, Camels and Llamas *Sears, The Firefly, p. 14 Bevans, The Book of Reptiles and Amphibians Hoke, The First Book of Snakes, p. 47 *Ballard, The True Book of Reptiles *Brouillette, Insects Swain, Insects Hogner, Spiders, pp. 42-45 *Leyson, Manty the Mantis Adler, Insects and Plants *Hogner, Earthworms *Palazzo, Did You Say Dogs? Unitext *Blough, Useful Plants and Animals *Taber, The First Book of Dogs **Filmstrips:** "The True Book of Birds" "Our Insect Enemies and Insect Friends" **Films:** "How Animals Help Us" "Farm Animals" **Recordings:** "The Frog Song"(S209-C5) "Insect Life,"Standard Oil Company (LP50-C1) **Charts:** "Earthworm"

ACTIVITIES

Some animals are helpful by eating pests, loosening the soil, pollinizing plants, and by aiding in fertilization of the soil.

Discuss why Charles Darwin, an English scientist who lived in the nineteenth century, called the earthworms the "most valuable animals."

Get some fresh soil that includes an earthworm. Keep soil moist.

Discuss the importance of camels to the people of Arabia.

Discuss why horses, dogs, cows, etc., are important to humans.

Explain how snakes are milked of their venom to make antivenin. Antivenin has saved many lives.

Discuss how silk from the black widow is used in telescopes and sighting tools.

Talk about the importance of the silkworm.

HLC:djm